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BIENNIAL EVALUATION OF CONNECTICUT'S INSPECTION/MAINTENANCE PROGRAM

2010 and 2011

AND

ANNUAL EVALUATION OF CONNECTICUT'S INSPECTION/MAINTENANCE PROGRAM

2011

FINAL REPORT

Prepared for:

Connecticut Department of Energy and Environmental Protection

Prepared by:

dKC – de la Torre Klausmeier Consulting
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Executive Summary

As required by the Clean Air Act Amendments of 1990, the Connecticut Department of Energy and Environmental Protection (DEEP) in partnership with the Connecticut Department of Motor Vehicles (DMV) conducts periodic evaluations of its enhanced Motor Vehicle Inspection and Maintenance (I/M) Program. This report is being submitted in fulfillment of the requirements to provide annual and biennial I/M reports per 40 CFR 51.366. This report addresses data collected from January 1, 2010 through December 31, 2011. As evidenced by the high compliance rate, limited fraud and low waiver rate, this report demonstrates that Connecticut's I/M program effectively achieves the expected air quality benefits.

The United States Environmental Protection Agency (EPA) provided a checklist (Appendix A), which identified the data elements to be included in this report. Comments provided by the EPA on Connecticut's 2008-2009 Biennial Evaluation Report and the 2010 Annual Report are addressed by this report. The required data, including data collected during 2010, and reports from previous years have been submitted to EPA. The 2011 data elements are compiled in Appendix B and correspond to the indexing system used in EPA's checklist. Due to the structure of Connecticut's I/M program, the following requirements of the attached checklist are not applicable: (a)(2)(xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xx) and (5); (b)(3)(ii), and (iv); (4)(iii), (6), (7); (d)(3) and (4).

The I/M program, designed to identify vehicles that emit pollutants that exceed acceptable standards and require such vehicles to get repaired, is an important part of the strategy to ensure that Connecticut is positioned to attain and maintain the 1997 National Ambient Air Quality Standard (NAAQS) for Ozone (i.e., smog). Connecticut's I/M program, which dates back to 1983, has a long history of effectively reducing vehicle emissions and results in more emission reductions than any other state-implemented reduction strategy. Current estimates indicate that in 2010, this program would have provided approximately 19 of the 200 tons per day of air pollutant reductions that are included in Connecticut's 2008 Ozone Attainment Demonstration State Implementation Plan. The emission reductions resulting from this program are an integral part of Connecticut's air quality attainment efforts, and important as part of a balanced strategy that includes reductions from stationary, area and mobile source sectors to ensure that Connecticut attains the Ozone NAAQS. EPA has since strengthened the Ozone NAAQS in 2008 resulting in Connecticut's proposed designation of nonattainment for the new 75 ppb eight-hour ozone standard. EPA is expected to issue an even more stringent Ozone NAAQS by 2014. If EPA does so, Connecticut will need to achieve even greater emission reductions from motor vehicles.

All of Connecticut continues to experience elevated ozone concentrations during the summer months. While in-state sources of air pollution such as cars and power plants contribute to ozone formation, much of the ozone and precursor emissions transported into Connecticut originate from sources located in upwind states. For example, during elevated ozone episodes in Connecticut, air quality measured at the state border with New York frequently exceeds the Ozone NAAQS, which is indicative of significant air pollution

transport. It is therefore imperative to address the transport challenge to assure clean air for Connecticut's citizens.

This report focuses on the effectiveness of Connecticut's I/M program. Key program highlights include:

- Major program changes in 2003, including:
    - Adoption of On-Board Diagnostic (OBD) II testing for 1996 and newer vehicles,
    - Creation of a decentralized network of 300 inspection stations, and
    - Enhanced enforcement by moving from window stickers to a registration denial based enforcement system.
- In 2010 and 2011, over 98% of the vehicles subject to testing were in compliance with I/M program requirements. The overall compliance rate in Connecticut exceeds the compliance rate of 96% specified in Connecticut's State Implementation Plan. Connecticut actively investigates non-compliance and assesses fines for late inspections. In 2010 and 2011, respectively, 159,163 and 162,936 fines were assessed for late inspections. Linking registration to compliance in addition to late inspection fines contribute to Connecticut's very high compliance rate.
- Approximately 11% of vehicles failed their initial emissions test and 12% of these vehicles also failed their first retest in both 2010 and 2011. Failure rates under the decentralized I/M program are equal to or higher than failure rates recorded under centralized I/M programs. Ongoing outreach efforts designed to decrease failure rates will continue to be enhanced.
- DMV performs extensive quality assurance checks on the program. Evaluation of these quality assurance data demonstrates that the program performs accurate inspections.
- Audits were conducted at all stations as part of an extensive anti-fraud program. 1,718 video surveillance audits were conducted in 2010 and 2,051 were conducted during 2011. Less than 0.1% of the inspections in Connecticut are suspect, exceeding many other states' I/M programs. Connecticut's anti-fraud efforts are models for other I/M programs.
- In May 2011, following a comprehensive evaluation and selection process, DMV entered into a new agreement with a private contractor, Applus, for the next phase of the Connecticut I/M program. This new program:
    - Began with a rolling implementation and is now fully operational.
    - Maintains the same overall structure and requirements while including upgraded equipment and computer systems

- Addresses many of the challenges faced by the previous system and ensures Connecticut's I/M program will continue to comply with statutory and regulatory mandates, while achieving clean air benefits.

Connecticut consistently conducts thoughtful analysis of its vehicle inspection and maintenance program, which has led to numerous enhancements. In the past year, several initiatives, such as instituting more safeguards to ensure correct vehicle identification numbers and review of the fleet testing program, are being implemented to further strengthen the program. A full iteration of the changes to the program can be found in Section 8. Connecticut's analysis repeatedly has demonstrated the program produces the expected air pollutant reductions. DEEP and DMV continue to evaluate opportunities to improve the program and cost effectively increase the air quality benefits.

1.0 Introduction

This report presents an analysis of data collected in Connecticut's Motor Vehicle Inspection and Maintenance (I/M) program in 2010 and 2011 to meet the United States Environmental Protection Agency's (EPA) annual and biennial reporting requirements of 40 CFR Part 51.366. In an I/M program, vehicles are periodically inspected, and those with evidence that they exceed design emission standards must be repaired. I/M programs are mandated by the Clean Air Act and were limited to areas that EPA designated as "serious" or "severe" non-attainment for the ozone National Ambient Air Quality Standard (NAAQS). Connecticut's program, which dates back to 1983, has a long history of effectively reducing vehicle emissions and is an important part of the strategy to ensure that Connecticut is positioned to attain the NAAQS for ozone. Since Connecticut's ozone levels exceed the 2008 ozone NAAQS, additional emission reductions from all sectors, including motor vehicles, remain critical.

Connecticut's I/M program results in more emission reductions than any other state implemented reduction strategy. Current estimates indicate that in 2010, this program would have resulted in approximately 19 of the 200 tons per day of air pollutant reductions that are included in Connecticut's 2008 Ozone Attainment Demonstration[1]. The emission reductions resulting from this program are an integral part of Connecticut's air quality attainment efforts and important as part of a cost effective and balanced strategy that includes reductions from stationary, area and mobile source sectors.

Emissions reduction determinations are estimated using modeling that is approved by the EPA. The most recent State Implementation Plan (SIP) Revision, which addresses the I/M program, was developed using MOBILE6.2, the model which was approved for use by EPA at that time. EPA has since updated its modeling platform and has begun implementing a new model known as the Motor Vehicle Emissions Simulator (MOVES). States are required to use MOVES for attainment demonstrations at this time, for hot spot analysis by December 2012 and for regional conformity beginning March 2, 2013. This model is in the early stages of use and assumptions embedded in the MOVES model may change the estimated reductions for the I/M program.

Connecticut's I/M program identifies vehicles that have been tampered with, or have received improper maintenance. These vehicles must be repaired until they comply with emission standards. The Connecticut Department of Motor Vehicles (DMV) oversees the I/M program operated by a private contractor; the Connecticut Department of Energy and Environmental Protection (DEEP) ensures that the program achieves the air quality benefits as outlined in Connecticut's SIP.

The original program implemented in 1983 subjected vehicles to two inspections – an idle test where exhaust concentrations of hydrocarbons (HC) and carbon monoxide

1 The 2008 Ozone Attainment Demonstration details Connecticut's strategies designed to bring the state's air quality into compliance with the 1997 8-hour ozone NAAQS of 84 ppb.

(CO) were measured while the vehicle was idling and a visual inspection for the presence of emission control devices, such as the catalytic converter. Vehicles with gross vehicle weight ratings (GVWR) of 10,000 pounds (lbs.) or less were included in the program. In 1998, Connecticut substantially enhanced its existing I/M program to meet new SIP requirements, as well as federal requirements for I/M improvements. The emission test changed from an unloaded idle emission test to a loaded-mode test (ASM2525[2]). With this change, Connecticut began evaluating emissions of oxides of nitrogen[3] (NO_x) along with HC and CO. The loaded-mode test uses a chassis dynamometer to simulate on-road driving. If the vehicle could not be safely tested on a dynamometer, it received a pre-conditioned two-speed idle (PCTSI) test. In addition, the inspection included a gas cap pressure test to check to see if the gas cap holds pressure. Leaking gas caps are a major source of evaporative HC emissions. The program continued to include a visual emission control component check. Also, at this time Connecticut began diesel testing.

In 2003, Connecticut again made substantial revisions to the program. The inspection network was changed from a centralized system with about 25 inspection stations to a decentralized system with a contractor equipped limit of 300 stations[4]. The goals of these changes were to improve customer convenience to the public by decreasing the waiting time for emissions testing, directly involve the repair industry with emissions testing, and enhance opportunities for small business development. In addition, 1996 and newer gasoline- powered models started receiving on-board diagnostic (OBD) tests[5], instead of ASM2525 or PCTSI exhaust emissions tests. All 1996 and later model year light-duty vehicles sold in the United States contain the second generation of OBD, termed OBDII. Connecticut also performs OBD tests on diesel powered vehicles that are model year 1997 and newer having a GVWR of 8500 lbs. and less. OBDII systems can detect malfunctions or deterioration of emission control components, often well before the motorist becomes aware of any problem. Inspecting vehicles by reading the OBDII system codes can identify vehicles with serious emission control malfunctions more accurately and cost-effectively than traditional tailpipe tests, and help technicians diagnose and repair those malfunctions. Diesel powered vehicles having a GVWR of 10,000 lbs. or less, receive tests for excessive exhaust smoke, if they cannot receive OBDII tests. Evaluating OBDII test results presents special challenges, since tailpipe emission results are not available for each vehicle.

In 2011, the state embarked upon a new program with upgraded equipment and

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2 The ASM2525 or Acceleration Simulation Mode test measures HC, CO and NO emissions while the vehicle is driven at a constant speed (25 MPH) on a treadmill-like device termed a dynamometer.

3 Nitric oxide (NO) is measured as a surrogate for oxides of nitrogen (NO_x). NOx along with HC emissions are considered to be the major ozone precursors.

4 This number dropped from 300 stations to 250 stations by the end of 2008.

5 1997 and newer light-duty diesels (<8500 lbs. GVWR) also get OBD inspections.

computer systems to correct challenges faced the previous system. As part of this new program, DMV is in the process of working with their contractor, Applus, to evaluate and implement new improvement measures to maximize the cost effectiveness and benefits of the program.

The methodology for this report has instead utilized data on different inspection components to determine if the appropriate number of vehicles are being failed and repaired. This multifactorial approach is consistent with the purpose of the OBDII system, since it assures that Connecticut is identifying, and requiring the repair of vehicles that exceed design emission standards by more than 50%, as required by the EPA. Evaluating decentralized inspections requires a comprehensive assessment of how well stations comply with mandated inspection procedures. Generally, there are greater opportunities for fraud in decentralized facilities, because there are more stations that need policing. Using data and procedures provided by the DMV, de la Torre Klausmeier Consulting, Inc. (dKC) assessed effectiveness and enforcement of Connecticut's program.

2.0 Observed Failure Rates for Gasoline-Powered Vehicles

Failure rates for gasoline-powered vehicles were calculated using test results from I/M test stations. Below is a brief description of the criteria used to determine if a vehicle passes or fails inspection.

Pass/Fail Criteria

ASM2525 or Pre-Conditioned Two-Speed Idle (PCTSI) Inspection (pre-1996 vehicles): Vehicles fail if they exceed Connecticut's cut points or emissions standards. For the ASM2525 test, HC, CO and NOx emissions are evaluated. For the PCTSI test, HC and CO emissions are evaluated. Connecticut uses EPA's recommended cut points for the ASM2525 and PCTSI tests.

Gas Cap Test: Vehicles fail if their gas cap cannot hold pressure. Beginning in November 2004, only pre-1996 light-duty vehicles receive gas cap tests. The OBDII system adequately tests a vehicle's evaporative system on most 1996 and newer vehicles.

OBDII Inspection: 1996 and newer light-duty vehicles are subject to an OBDII inspection. The emissions test system is plugged into the OBDII connector and information on the status of the vehicle's OBD system is downloaded. Vehicles fail the OBDII inspection if they have the following problems:

- Malfunction Indicator Lamp (MIL[6]) is commanded-on;
- MIL not working (Termed Key-On Engine-Off, KOEO, failure[7]);
- The number of readiness monitors that are not ready exceed EPA's limit[8]:
    - 1996-2000 models: Two monitors are allowed to be not ready.
    - 2001+ models: One monitor is allowed to be not ready.
- OBD Diagnostic Link Connector (DLC) damaged; or
- Vehicle could not communicate with the Connecticut inspection system.

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5 MIL is a term used for the light on the instrument panel, which notifies the vehicle operator of an emission-related problem. The MIL is required to display the phrase "check engine" or "service engine soon" or the ISO engine symbol. The MIL is required to illuminate when a problem has been identified that could cause emissions to exceed a specific multiple of the standards the vehicle was certified to meet.

7 The Key-On Engine-Off (KOEO) determines if the MIL bulb is working. The bulb should illuminate when the vehicle is turned on but not started.

8 OBDII systems have up to 11 diagnostic monitors, which run periodic tests on specific systems and components to ensure that they are performing within their prescribed range. OBDII systems must indicate whether or not the onboard diagnostic system has monitored each component. Components that have been diagnosed are termed "ready", meaning they were tested by the OBDII system.

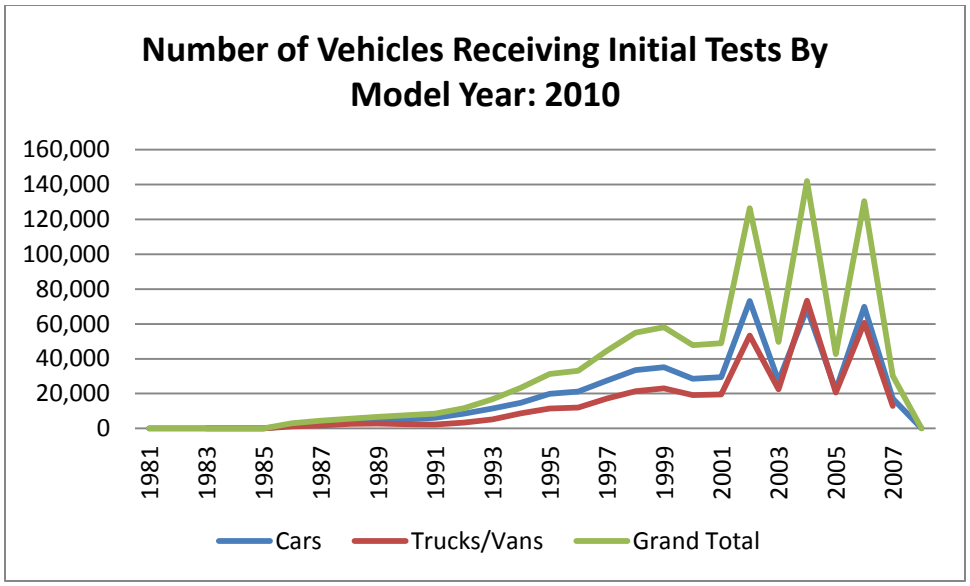
Summary of Fail Rates for Gasoline-Powered Vehicles

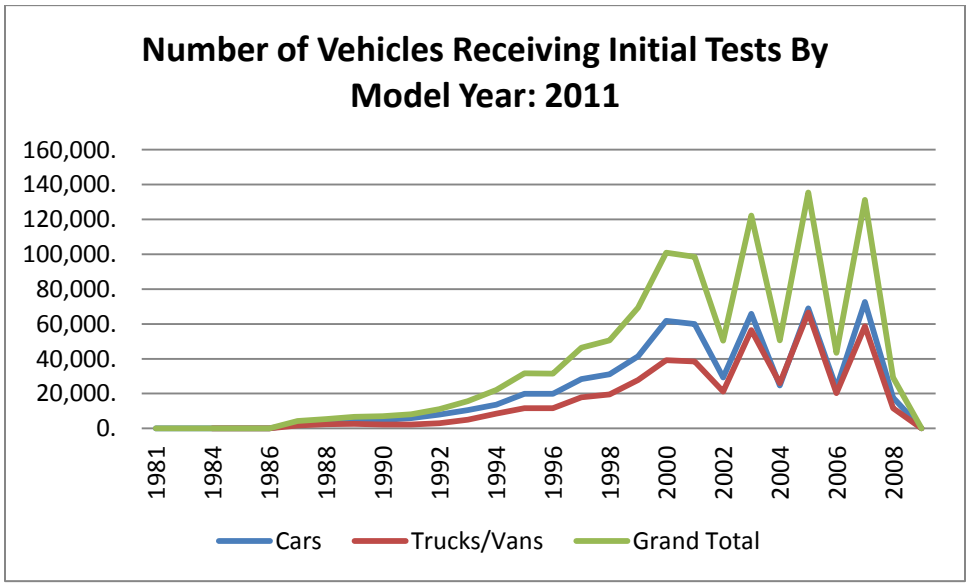
Following is a summary of test results from January 1, 2010 to December 31, 2011. In 2010, 927,525 gasoline-powered vehicles received initial tests. In 2011, 1,055,739 gasoline-powered vehicles received initial tests. The table below compares failure rates in 2010 and 2011 for different tests that are performed on gasoline powered vehicles.

Test Type	Parameter	2010	2011
OBD	% Fail Initial (any reason)	11%	11%
	% Fail for MIL Commanded-on	6.0%	6.0%
	% Fail First Retest	10%	10%
ASM	% Fail Initial	12%	12%
	% Fail First Retest	28%	27%
PCTSI	% Fail Initial	8.5%	8.5%
	% Fail First Retest	15%	13%
Gas Cap	% Fail Initial	4.5%	4.8%
	% Fail First Retest	3.9%	4.2%
All Tests	% Fail Initial	11%	11%
	% Fail First Retest	12%	12%

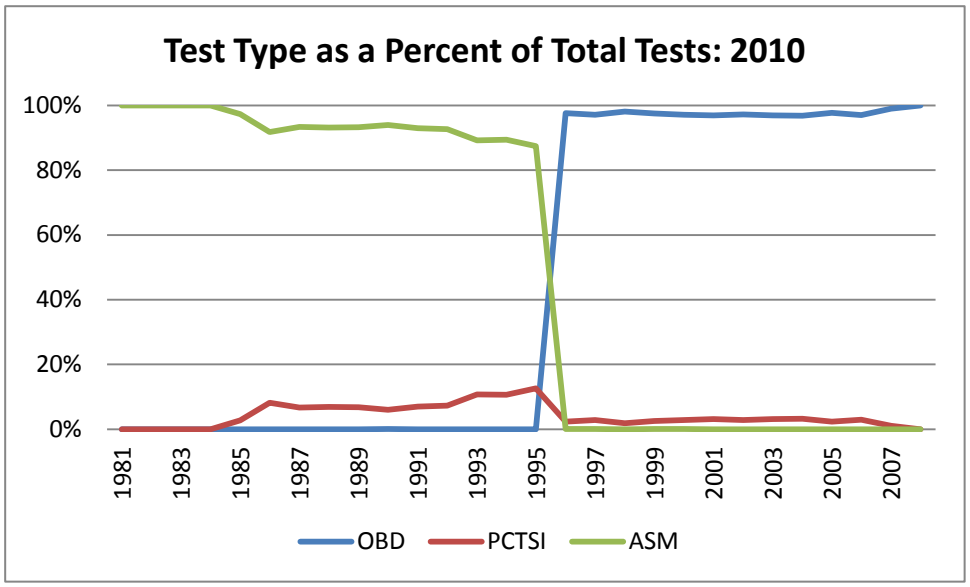
Conclusion: These failure rates are comparable to results in previous years. Failure rates in Connecticut's I/M program are in line with those reported in Test-Only programs[9]. Test-Only programs generally are considered by EPA to be the model for peak I/M performance. Based on failure rates, Connecticut's I/M program is operating at peak performance.

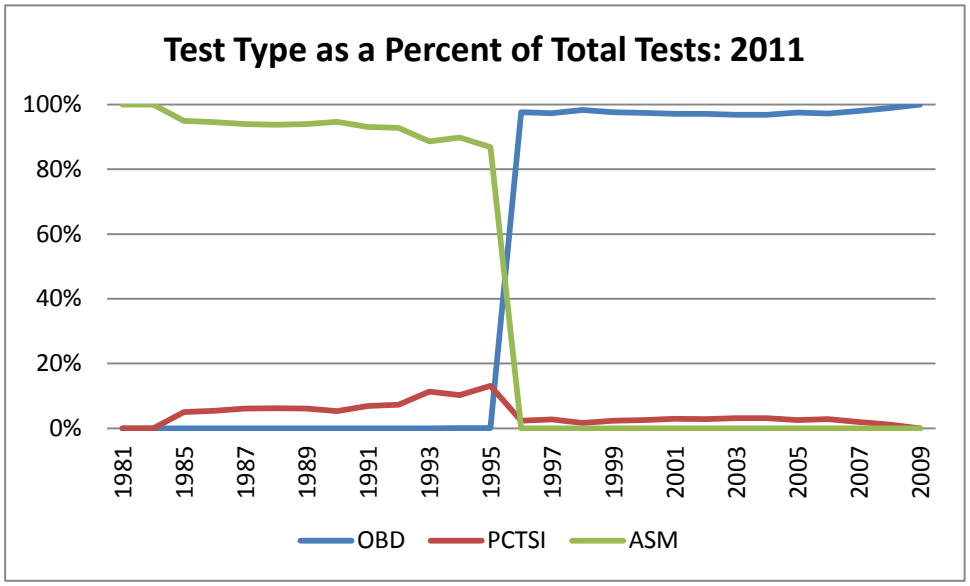
[9] At the end of this section is a chart that compares failure rates for the OBD test in Connecticut with failure rates in Delaware. Delaware is a well enforced Test-Only I/M program. Failure rates in both programs are nearly identical.



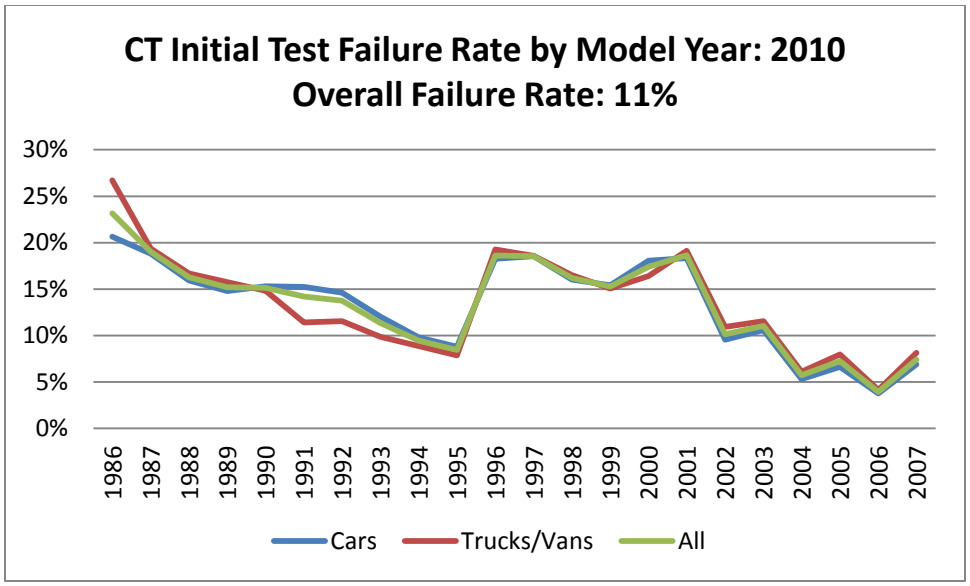


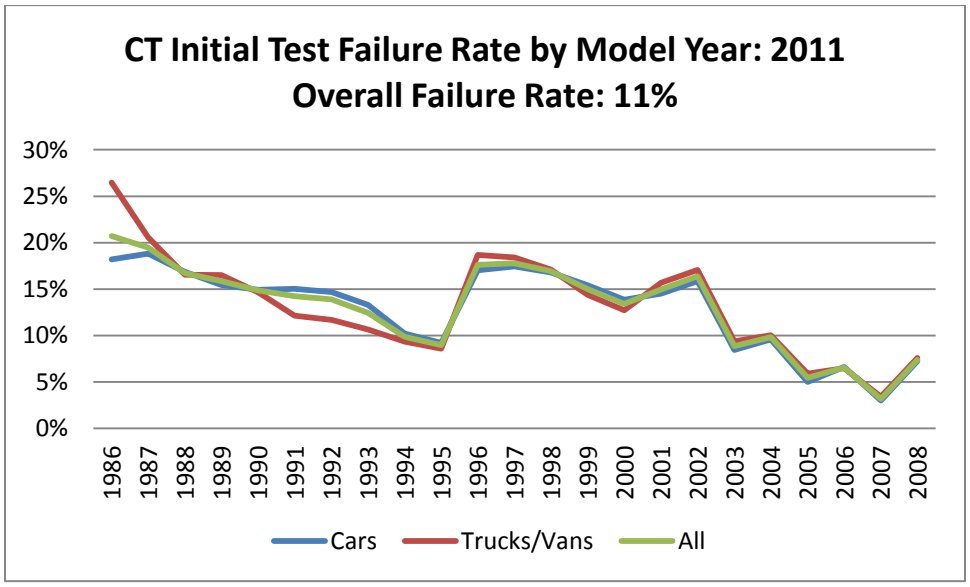
These charts show the total number of inspections by vehicle model year, and vehicle type. The first four vehicle model years are exempted from testing, so the number drops sharply after the 2006 model year for 2010 and the 2007 model year for 2011. All vehicles have a 10,000 lbs. or less GVWR.





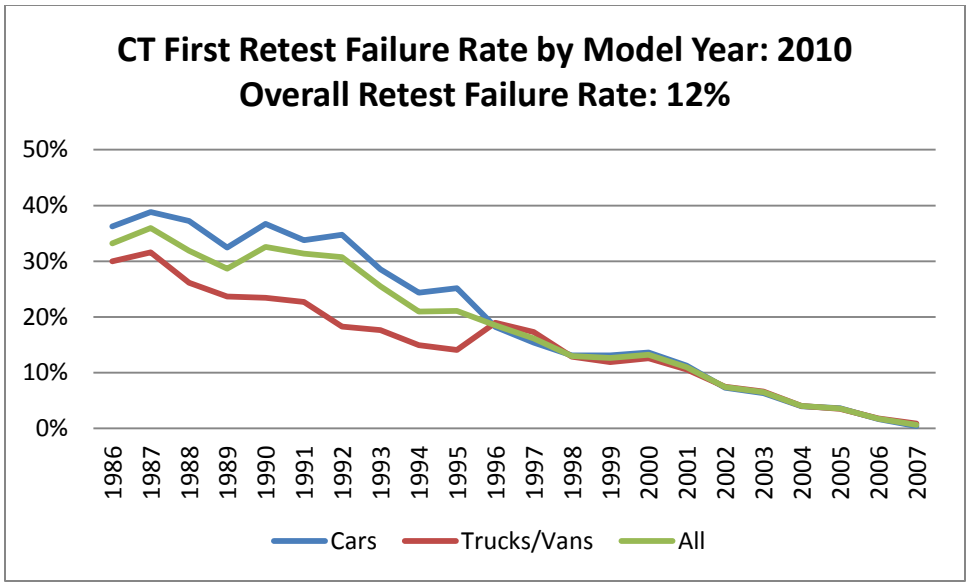
These charts show the total number of inspections by vehicle model year and final inspection type. Most 1996+ vehicles received OBDII tests. A small percent (2%) of the vehicles newer than 1996 were models over 8500 lbs. GVWR without OBD systems.

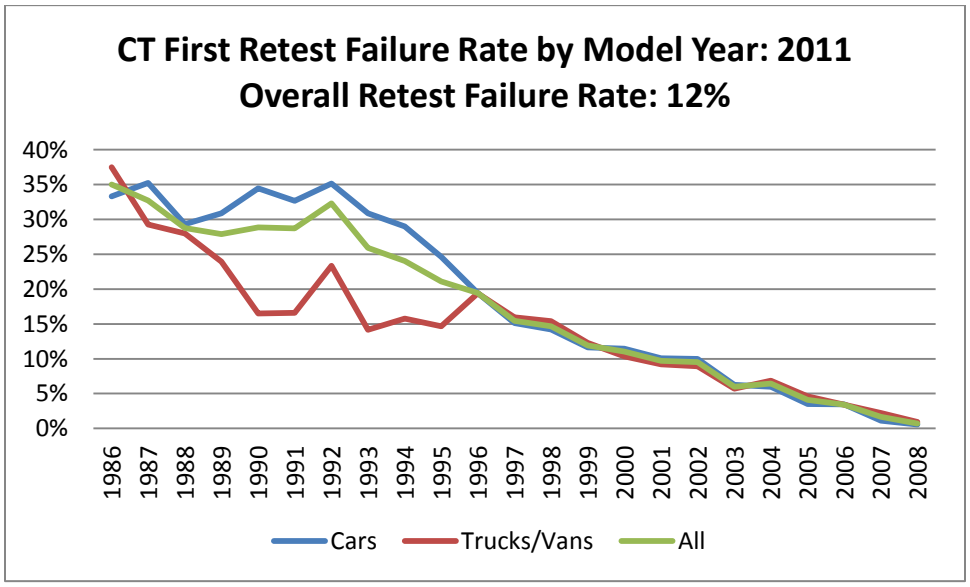




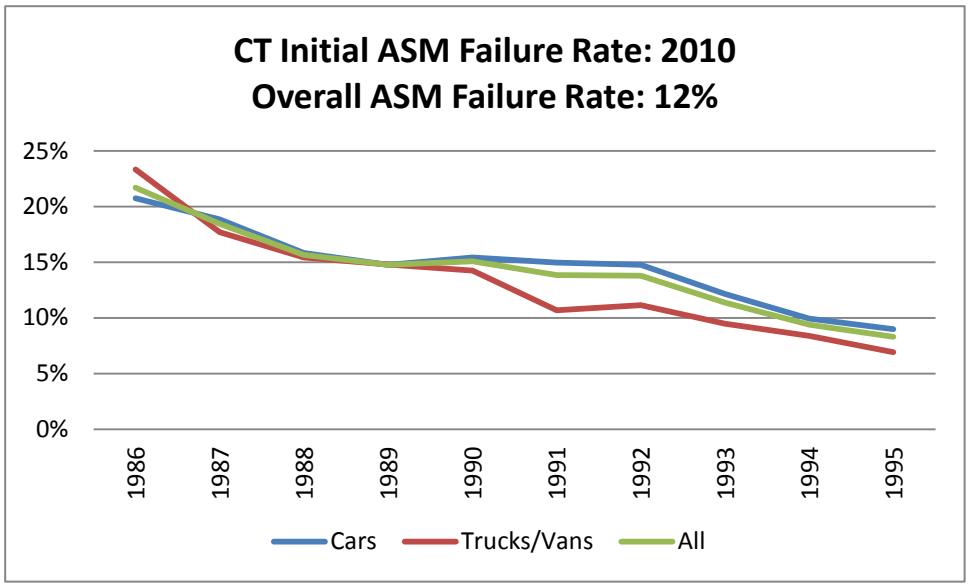
These charts show the overall percentage of vehicles that failed the tailpipe test, gas cap test, visual emission control component test, or the OBD test. Some vehicles failed more than one inspection component. As expected, the failure rate is generally lowest for new vehicles. Following the pattern seen previously, the failure rate for cars and trucks spiked upwards for 1996 model year vehicles, due to increased stringency associated with the implementation of the OBDII test. Compliance with the OBDII test is considered to be more difficult than compliance with the ASM2525 or PCTSI test. The failure rate is consistent with failure rates reported in test-only programs in other jurisdictions. The high initial failure rate for 2007 model year vehicles in 2010 and the 2008 model year vehicles in 2011 is due to the fact that over half of these vehicles tested had dealer plates. Vehicles owned by dealers typically have high not ready rates because their batteries are often insufficiently charged, or had been disconnected during dealer prep[10].

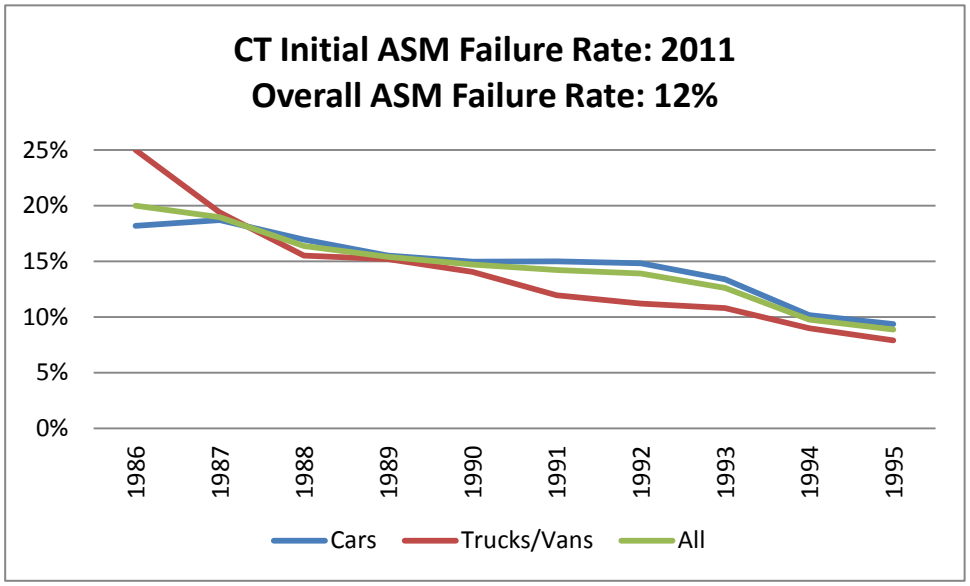
[10] Readiness status for all monitors usually sets to not ready when a vehicle's battery is disconnected.



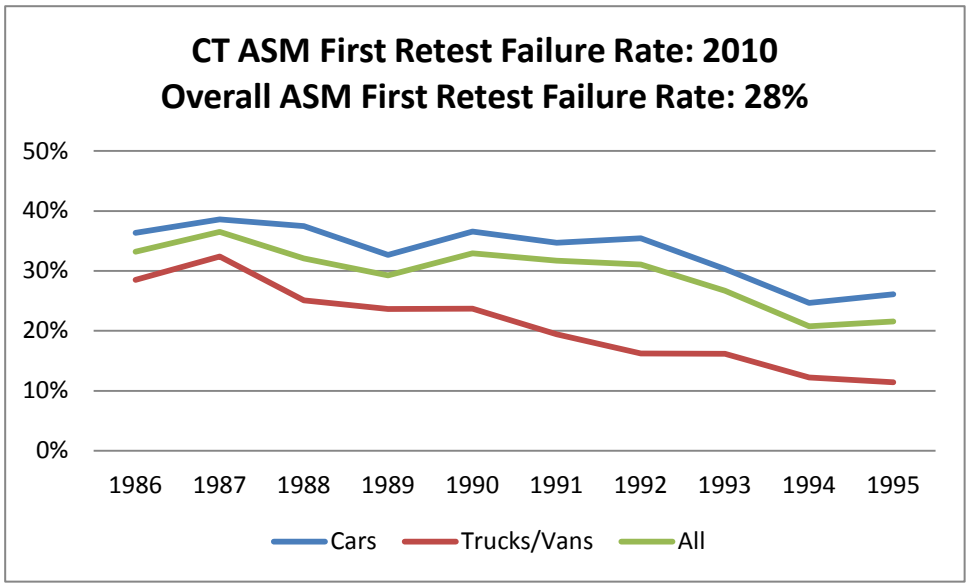


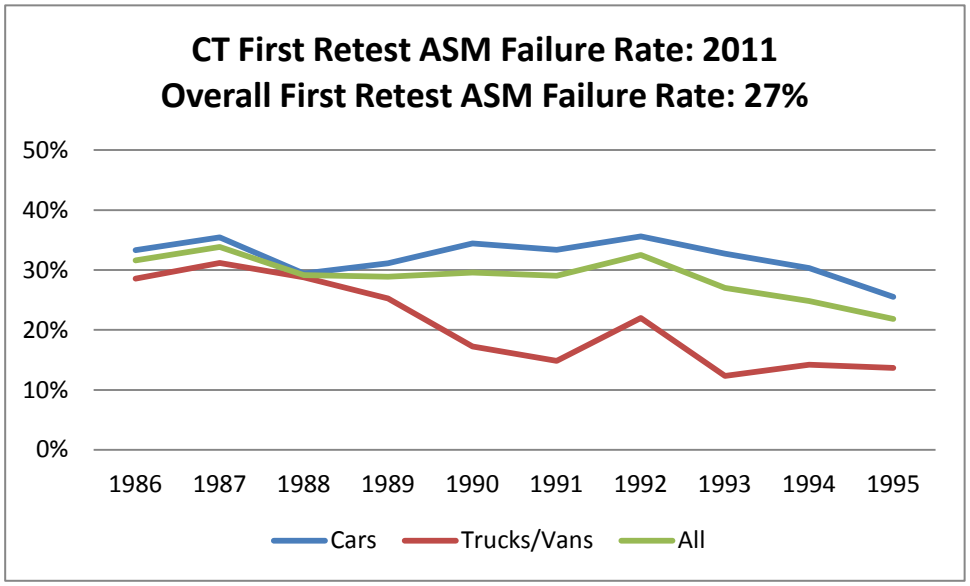
These charts show the percent of vehicles by model year that failed their first retest. The failure rate is highest for the older model year vehicles, which is typical. Overall, in both years 12% of the vehicles tested failed their first retest.



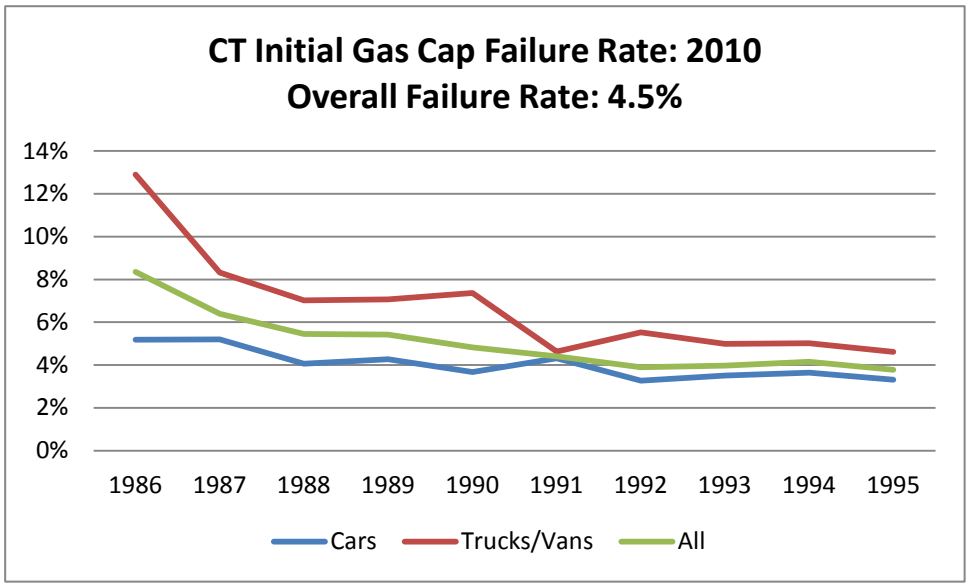


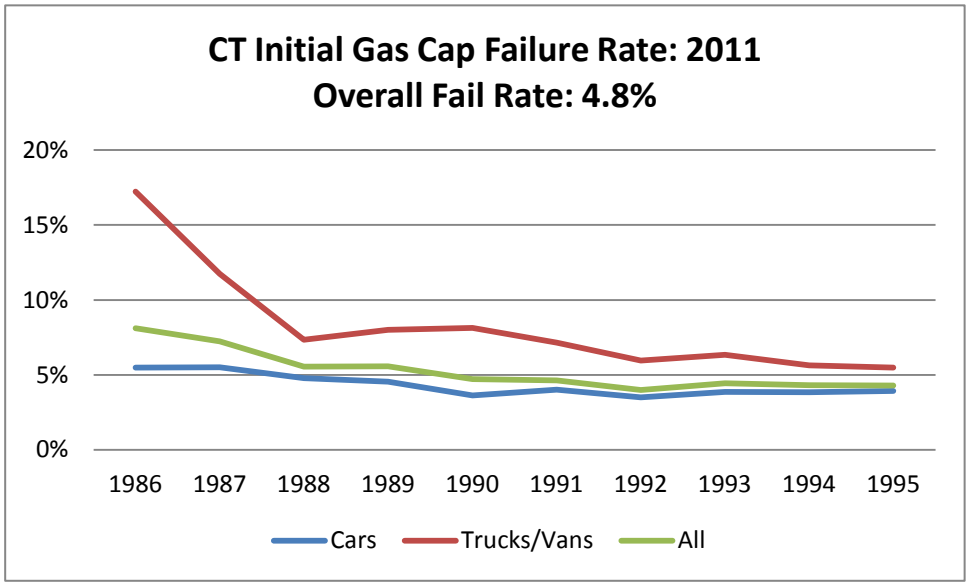
These charts show failure rates by vehicle model year for the ASM test. In both years, the average ASM test failure rate for all vehicles was 12%. Typically, a higher failure rate for older model year vehicles is expected. 1996 and newer model year vehicles received ASM or PCTSI tests, only if they were not equipped with OBDII systems. As a result, there were not enough ASM tests on 1996 and newer vehicles to analyze trends.



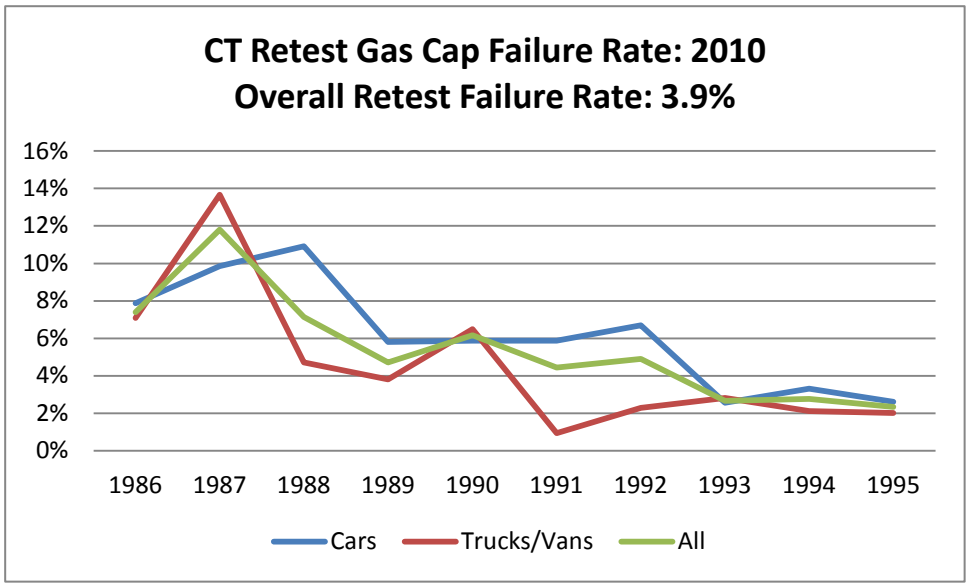


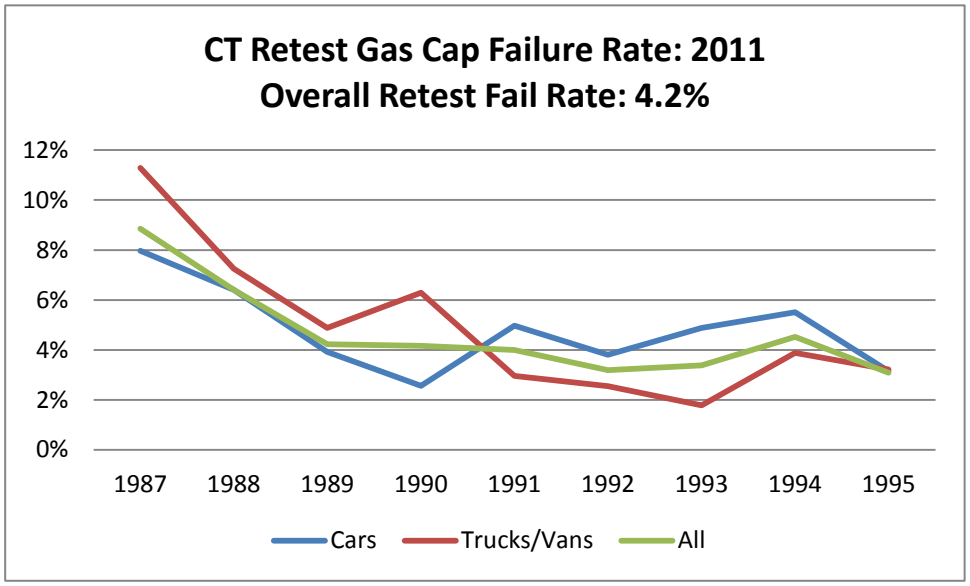
These charts show the percentage of vehicles by vehicle model year that failed their first ASM retest. The retest failure rate generally is highest for the older vehicles. Overall, 27% to 28% of the vehicles failed the first ASM retest.



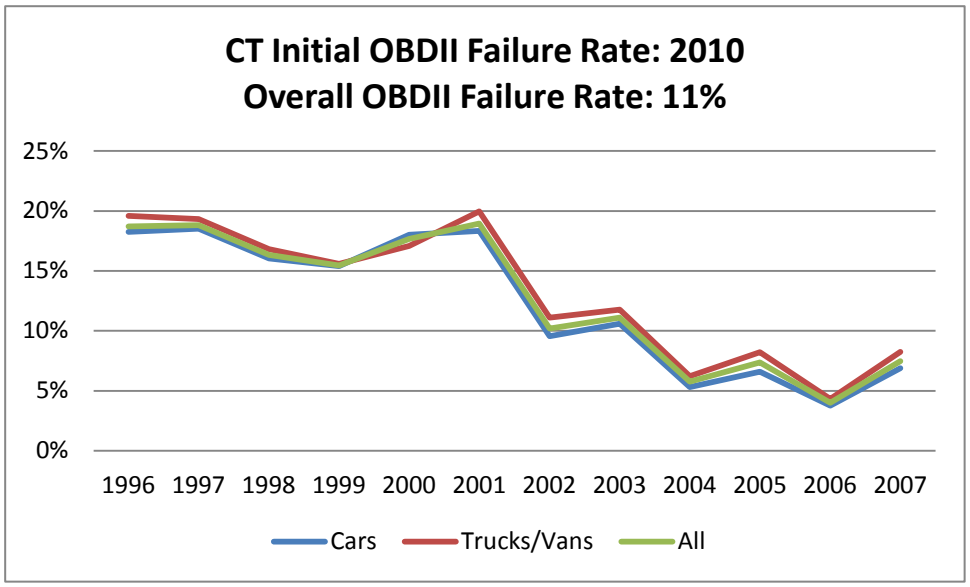


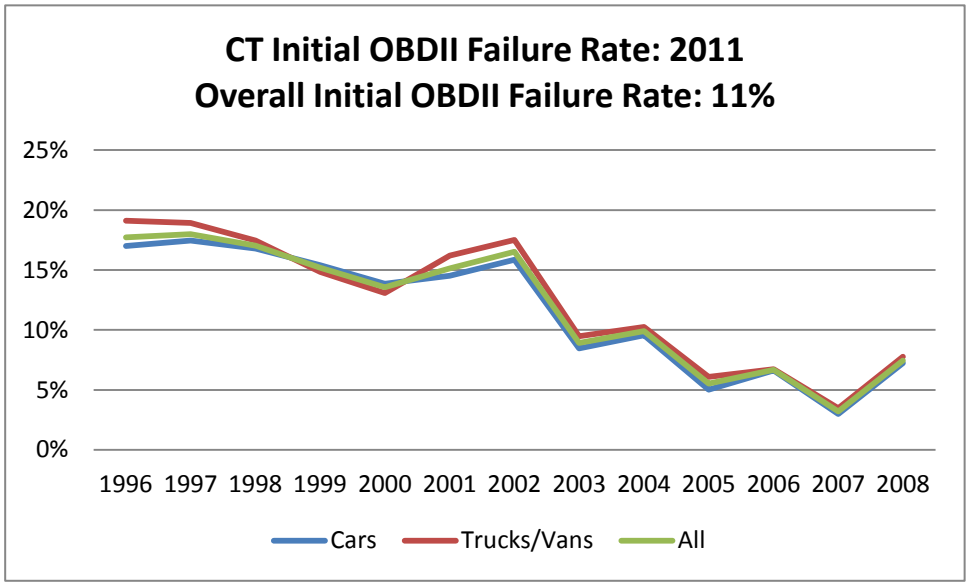
These charts show the gas cap pressure test failure rate by vehicle model year. Overall, 4.5% to 4.8% of the vehicles that receive gas cap tests fail the test. As with the ASM2525 test, the failure rate is higher for older vehicles, which is expected. 1996 and newer light-duty vehicles no longer receive gas cap tests.



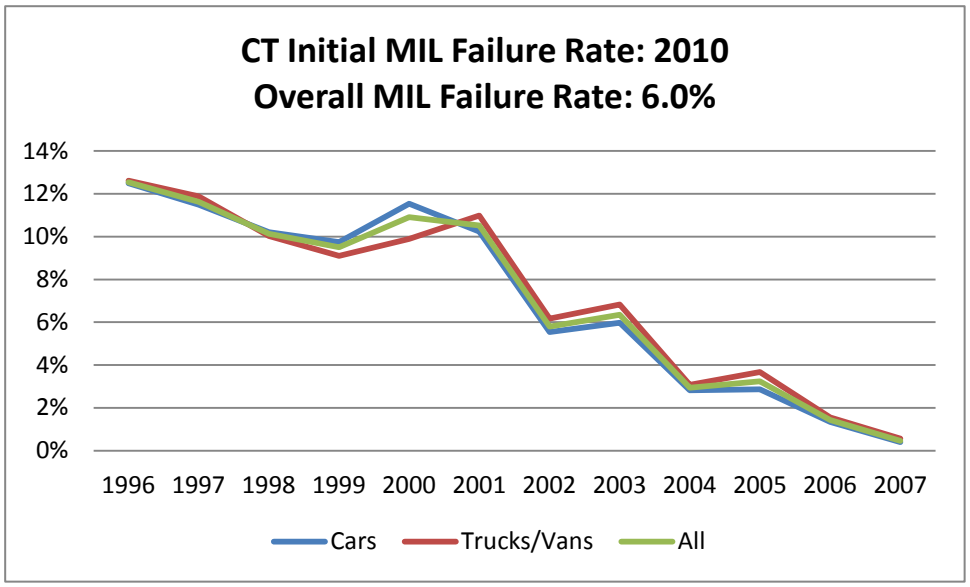


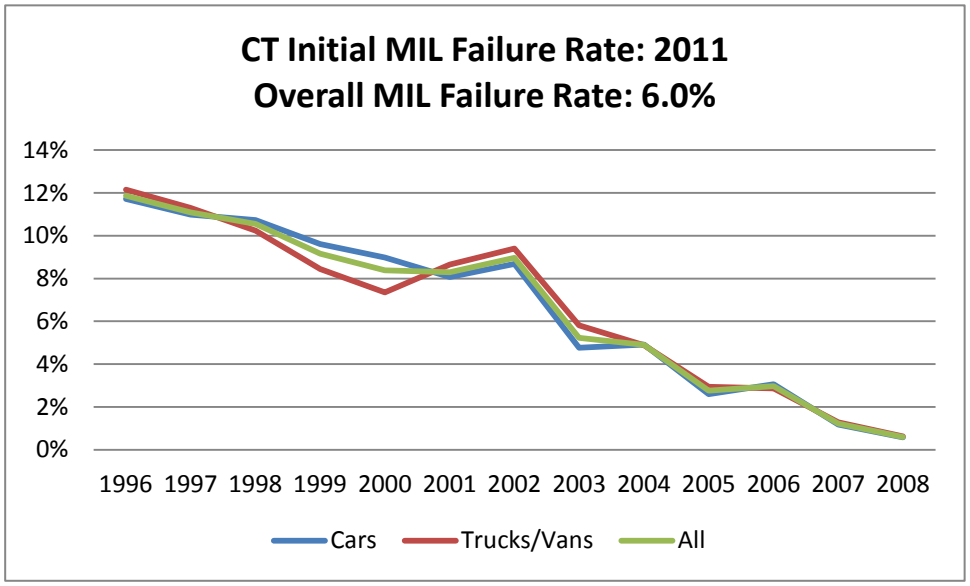
These charts show the gas cap retest failure rate by vehicle model year. Overall, 3.9% to 4.2% of the vehicles fail the first gas cap retest. As expected, the retest failure rate is highest for the older model year vehicles.



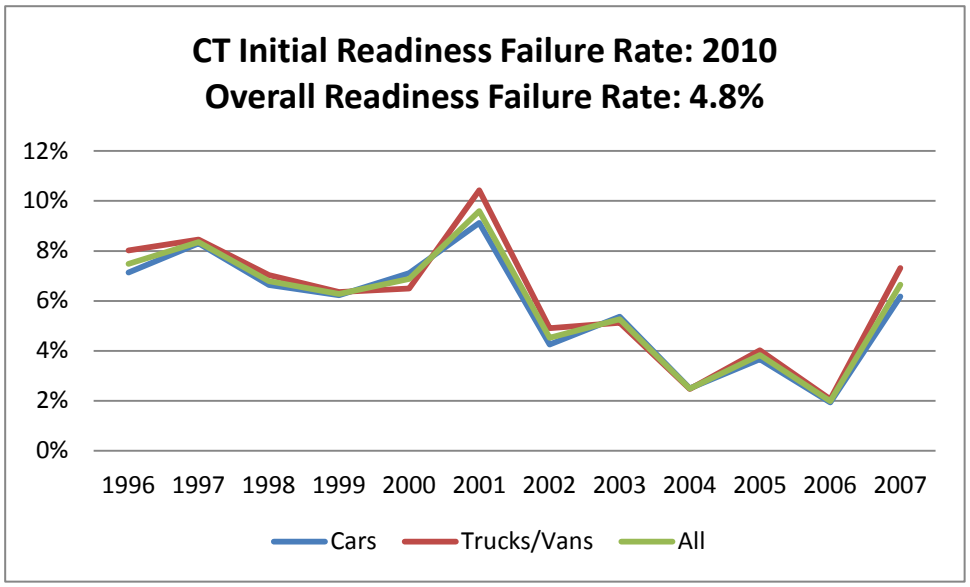


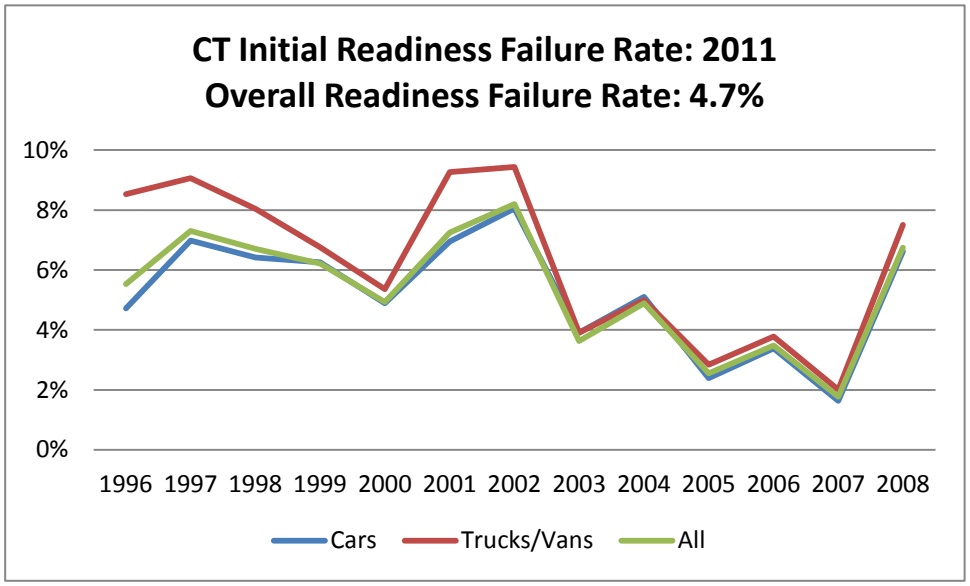
These charts show failure rates by vehicle model year for the OBD test. In both years, the average OBD test failure rate for all vehicles was 11%. Typically, a higher failure rate for older model year vehicles is expected. 19% of the 1996 model year vehicles failed the test. EPA requires that the 2001 and newer model year vehicles have at most one monitor not ready as opposed to two for 2000 and older model year vehicles. This change in readiness requirement explains the slightly elevated failure rate for 2001 model year vehicles. The increase in failure rates for 2007 model year vehicles in 2010 and the 2008 model year vehicles in 2011 reflects a high "not-ready" rate for these models. The high initial failure rate for 2007 model year vehicles in 2010 and the 2008 model year vehicles in 2011 is due to the fact that over half of these vehicles had dealer plates. Vehicles owned by dealers typically have high not ready rates, because their batteries are often insufficiently charged, or had been disconnected during dealer prep.





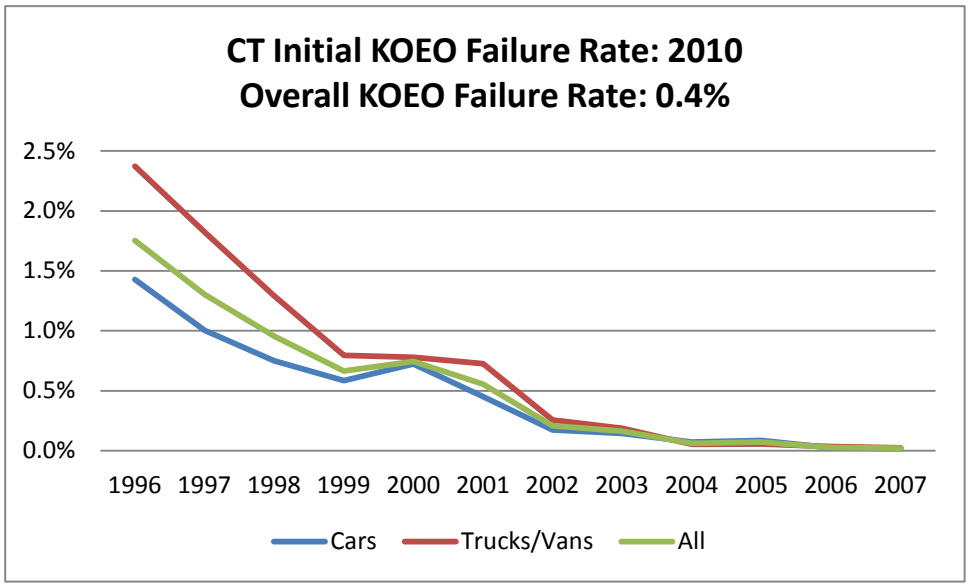
These charts show the percentage of vehicles that fail the MIL Command check that's part of the OBD test. Most OBDII failures are for the MIL Command check. The average MIL failure rate for all vehicles was 6% in both years. This graph shows that older model year vehicles have a higher failure rate, as expected.

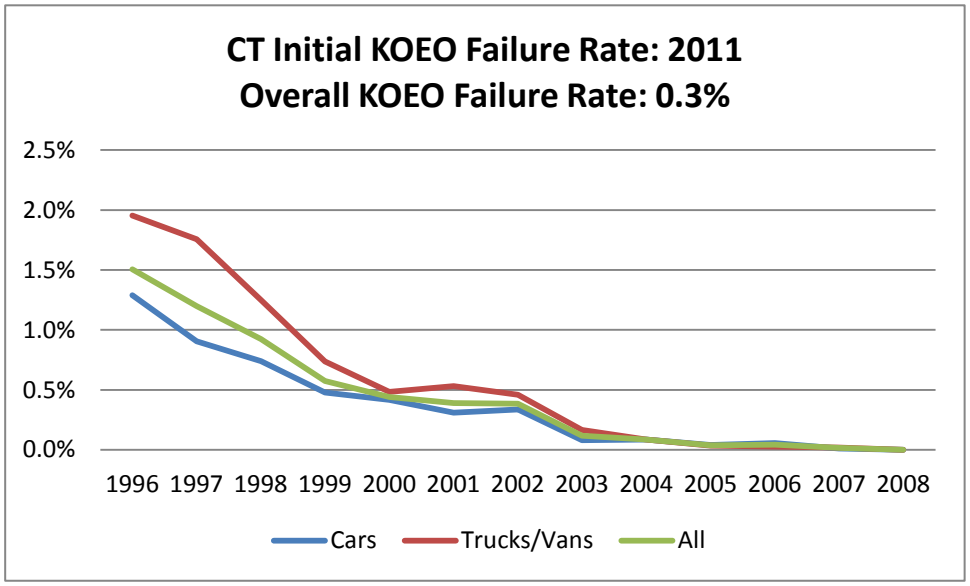




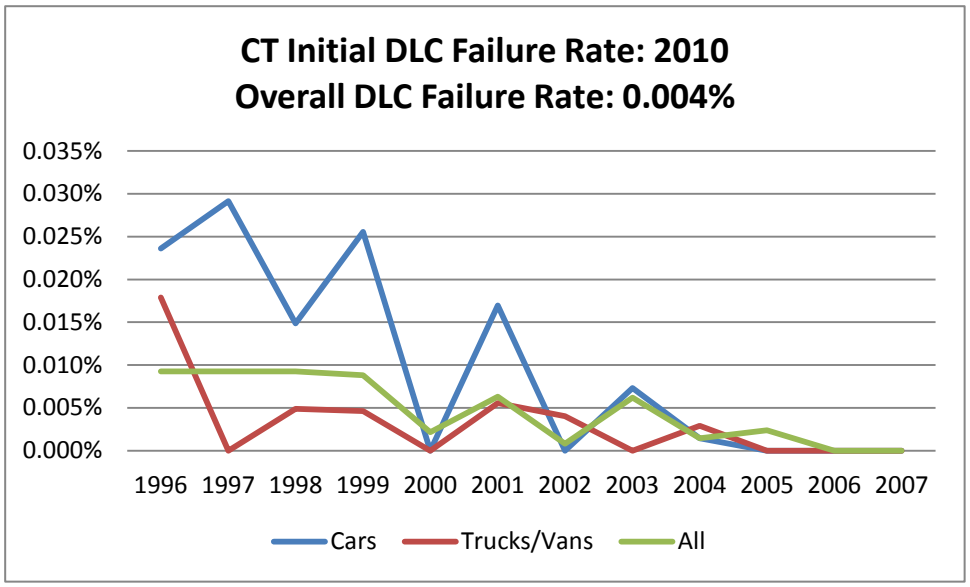
These charts show the percentage of vehicles that exceed EPA's readiness criteria. OBDII systems must indicate whether or not the onboard diagnostic system has monitored each component. Components that have been diagnosed are termed "ready", meaning they were tested by the OBDII system. EPA requires that 2001 and newer model year vehicles have at most one monitor not ready as opposed to two for 2000 and older model year vehicles. This change in readiness requirement explains the elevated failure rate for 2001 model year vehicles. The high "not ready" rate for 2007 models in 2010 and 2008 models in 2011 is due to the fact that over half of the 2007 and 2008 vehicles tested, had dealer plates. Vehicles owned by dealers typically have high not ready rates, because their batteries are often insufficiently charged, or had been disconnected during dealer prep[11]. Overall, 4.7% to 4.8% of the vehicles failed EPA's readiness criteria.

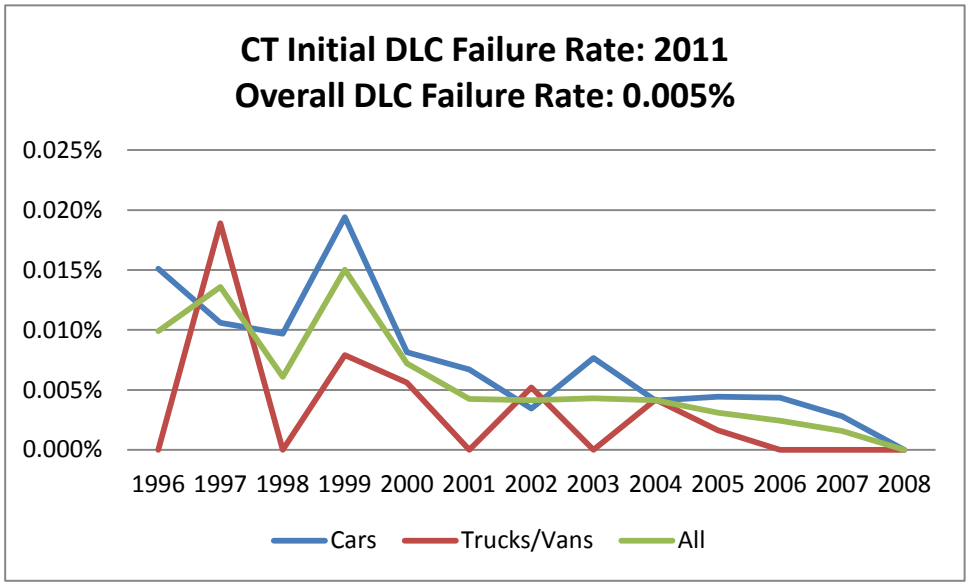
[11] Readiness status for all monitors usually sets to not ready when a vehicle's battery is disconnected.



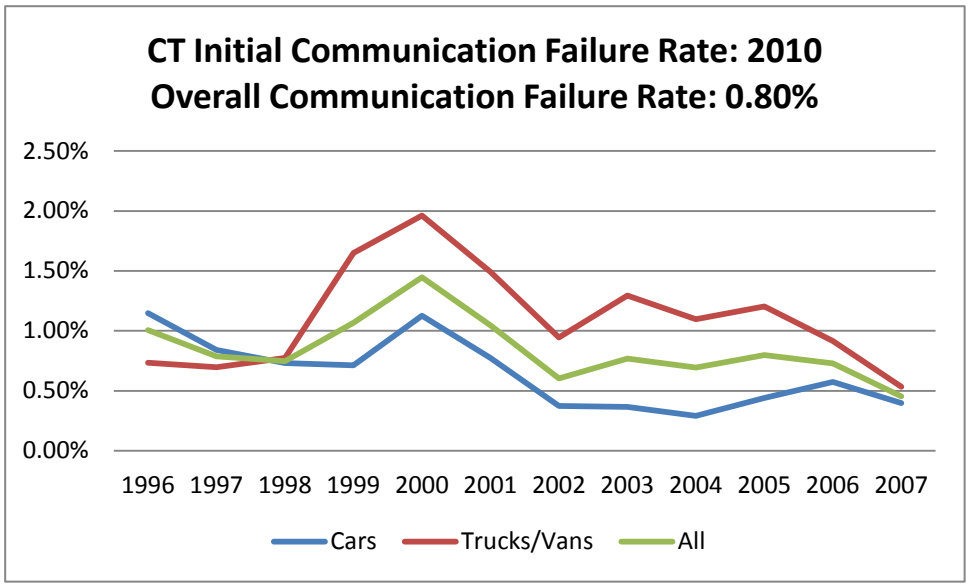


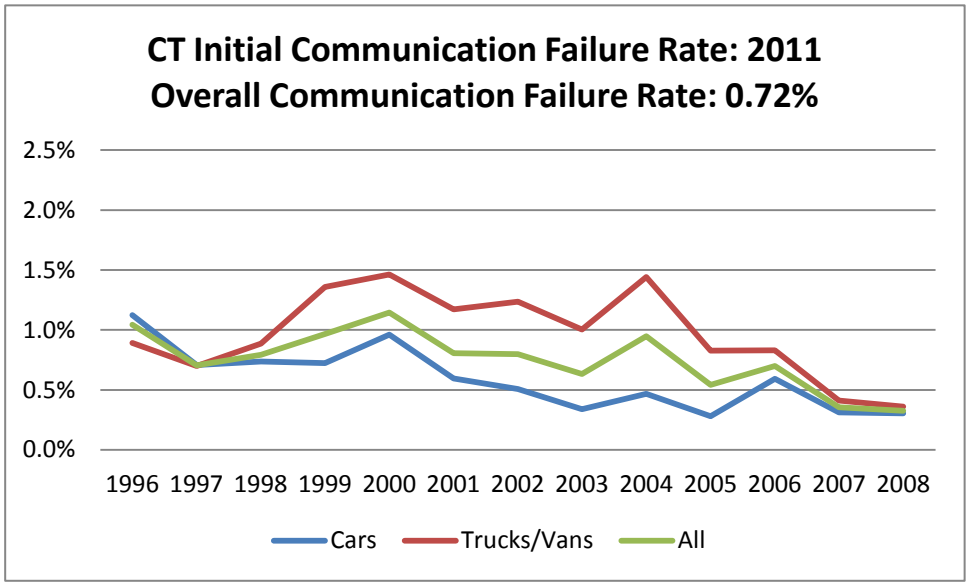
These charts show failure rates by vehicle model year for the Key-On Engine-Off (KOEO) test, which is part of the OBD test. The KOEO determines if the MIL bulb is operational. The bulb should illuminate when the vehicle is turned on, but not started. The average KOEO failure rate for all vehicles was 0.3% to 0.4%.



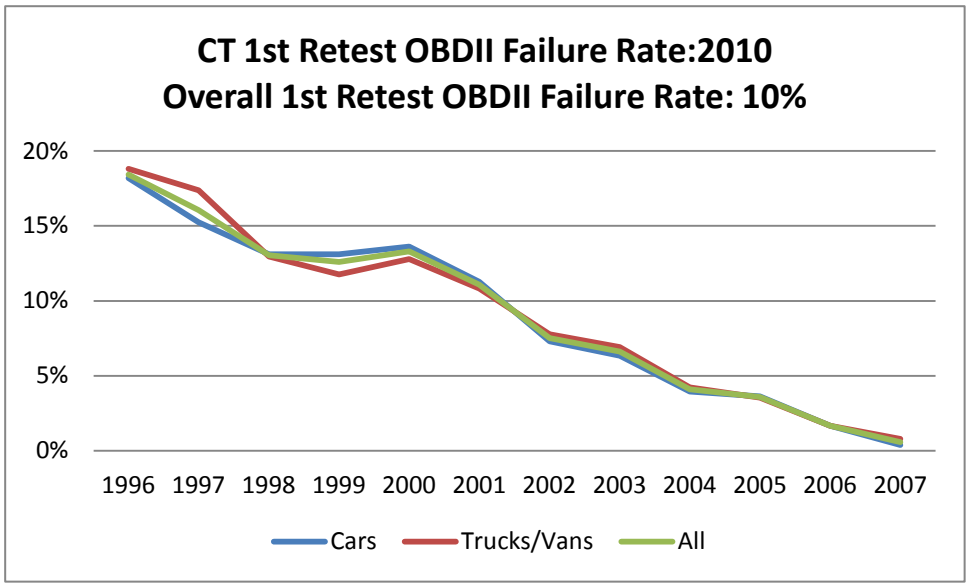


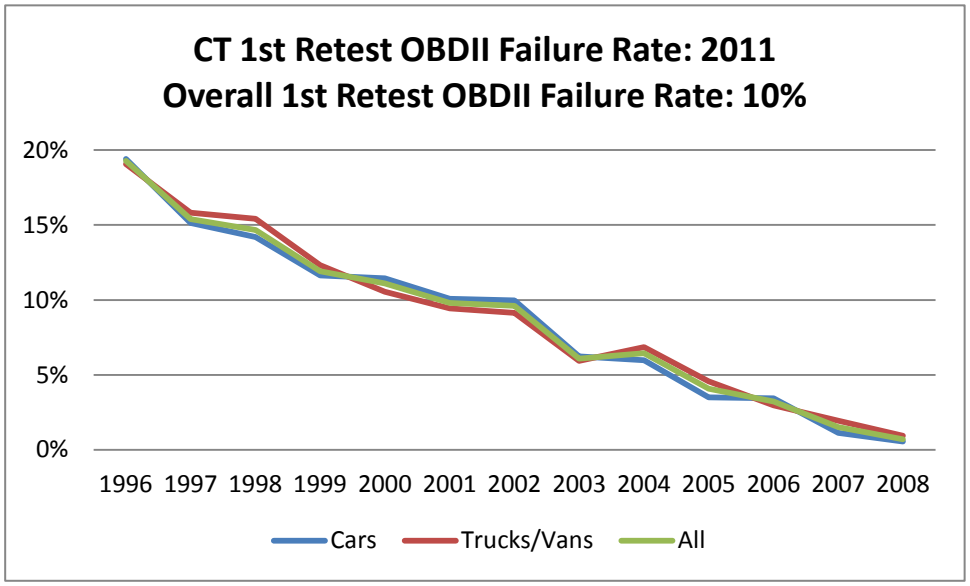
These charts show the percentage of vehicles that failed because the OBDII connector, termed the Data Link Connector or DLC, is missing, damaged or obstructed. Overall, few vehicles (0.004% to 0.005%) failed for this reason.



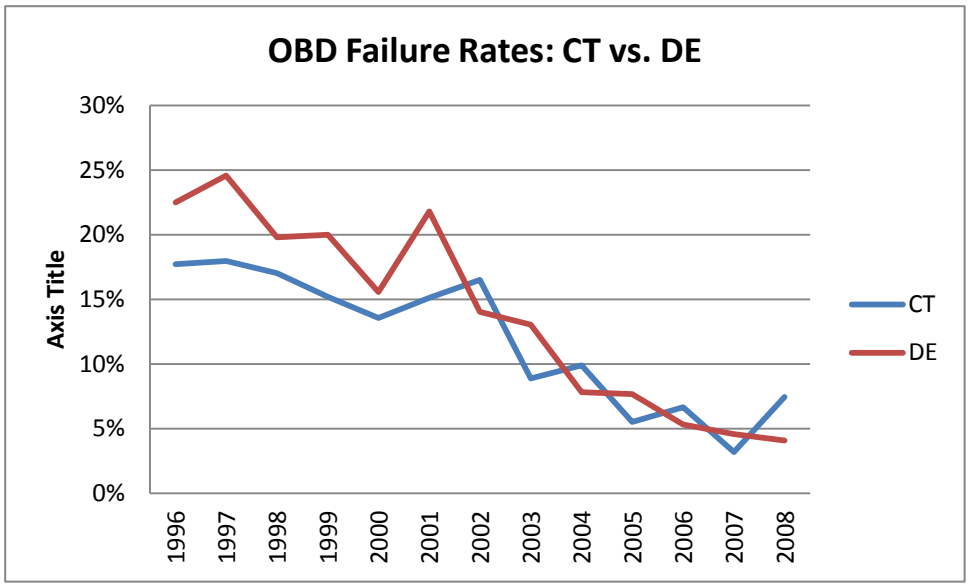


These charts show the percentage of vehicles that failed to communicate with the OBDII test equipment. Overall, 0.7% to 0.8% of the vehicles failed for this reason.





These charts show failure rates by vehicle model year for the first OBD retest. The average failure rate for all vehicles in the first OBD retest was 10%. Connecticut requires OBD failures to meet readiness requirements when retested. If a vehicle does not meet readiness requirements when retested, the inspection is aborted. Vehicles that are not ready on retest are not included in the above failed percentages.



This chart compares failure rates for the OBDII tests in Connecticut and Delaware. Delaware is a state-operated test-only program, which is considered by EPA to be a model for peak I/M performance. Failure rates in both programs are similar, which indicates that Connecticut is operating at peak performance with regard to failure rates.

3.0 Observed Failure Rates for Diesel-Powered Vehicles

Diesel-powered vehicles with a GVWR of 10,000 lbs. or less are also tested in the I/M program in Connecticut. Although the testing and reporting of diesel-powered vehicles is not required, historically Connecticut has reported on diesel testing. This report includes additional information on diesel initial testing, first retest as well as second and later retesting, to respond to EPA's request in their comments on 2010 Annual Evaluation of the Connecticut Inspection/Maintenance Program (2010 Evaluation). If the vehicle is equipped with an OBDII system, an OBDII test is performed. Otherwise, the vehicle receives a test designed to identify excessive exhaust smoke opacity.

Failure rates for diesel-powered vehicles were calculated using test results from I/M test stations. Below is a brief description of the criteria used to determine if a vehicle passes or fails inspection.

Pass/Fail Criteria

Modified Snap Acceleration (MSA) Test: With this test, the throttle is "snapped" (i.e., accelerator is quickly pressed and then released) and exhaust smoke opacity is measured. This test is performed with the vehicle being in "neutral". The average of three snaps is calculated, and compared to the standard recommended by the federal government.

Loaded Mode Diesel (LMD) Test: Vehicles are tested using a dynamometer to simulate driving at 30 mph. Exhaust smoke opacity is measured.

OBDII Inspection: 1997 and newer model year diesels vehicles with less than 8500 lbs. GVWR get an OBDII inspection. The emissions test system is plugged into the OBDII connector and information on the status of the vehicle's OBD system is downloaded. Diesel-powered vehicles will fail the OBDII inspection if they have any of the following problems:

- Malfunction Indicator Lamp (MIL) is commanded-on;
- MIL not working (Termed Key-On Engine-Off, KOEO, failure);
- OBD diagnostic link connector damaged.

Summary of Failure Rates for Diesel-Powered Vehicles

Following is a summary of test results for the January 1, 2010 to December 31, 2011 period. In 2010, 10,302 diesel-powered vehicles received opacity tests, and an additional 2,458 vehicles received OBD tests. In 2011, 10,950 diesel-powered vehicles received opacity tests, and an additional 2,383 vehicles received OBD tests. The table below compares failure rates in 2010 and 2011 for different tests that are performed on diesel powered vehicles. There were too few diesel powered vehicles receiving second and later retests to do an analysis of trends.

Test Type	Parameter	2010	2011
OBD	% Fail Initial	7.4%	8.4%
	% Fail First Retest	8.3%	10%
MSA	% Fail Initial	2.1%	2.3%
	% Fail First Retest	36%	45%
LMD	% Fail Initial	0.9%	0.9%
	% Fail First Retest	23%	12%

Appendix B has details on the OBD, MSA, and LMD test results for diesel as well as gasoline powered vehicles.

Conclusion: These failure rates are similar to rates found in previous evaluation reports. Outside of Connecticut, few states perform periodic tests on diesel-powered vehicles, so there is little basis for a comparison of Connecticut's diesel-powered vehicle failure rate with other states.

4.0 Enforcement of Connecticut's I/M Program

Connecticut's program uses both registration denial and late fee assessment to assure compliance. This section presents an analysis of data relevant to the enforcement of Connecticut's I/M program. Statistics required by 40 CFR 51.366 are presented below, and in the Appendix B, with exception of 40 CFR 51.366(d)(1)(iv) and (v) which are not applicable to Connecticut's program.

Overall Compliance Rate

The overall compliance rate is based on the number of passing inspections divided by the number of vehicles subject to inspection. Connecticut committed to a 96% compliance rate for the vehicles subject to I/M requirements in the SIP. In 2010 and 2011, over 98% of the vehicles due for inspection ultimately passed, so the overall compliance rate exceeds the SIP compliance rate.

Late Fees: In 2010, 159,163 late fees were assessed and in 2011, 162,936 late fees were assessed. These fines serve as an effective motivation for compliance with inspection requirements.

Preventing Circumvention of Connecticut's I/M Requirement

EPA requires states to prevent motorists from avoiding I/M requirements by falsely registering vehicles out of the program area, or falsely changing fuel type or weight class on the vehicle registration. EPA also requires states to report on results of special studies to investigate the frequency of such activity.

- **Circumventing I/M Tests in Connecticut –** Circumventing I/M tests in Connecticut is nearly impossible. First, Connecticut implements the I/M program on a statewide basis. Second, Connecticut tests all fuel types, including hybrids, so motorists cannot avoid inspection by changing fuel type. It may be possible to avoid inspection by registering the vehicle with a GVWR greater than 10,000 lbs., but likely is limited in scope due to the added expense. The majority of vehicles registered with an incorrect GVWR are those where the vehicle owner registers the vehicle at a lower weight to avoid the added expense and would not be emission eligible (>10,000 lbs.) with their corrected weight.
- **Detection and Enforcement Against Motorists That Falsely Change Vehicle Classifications To Circumvent Program Requirements –** Historically, 99% of emission eligible vehicles in Connecticut are in the Passenger, Commercial or Combination classifications. Incidents of motorists modifying a vehicle's registration classification to a non-emission eligible class are rare, most likely because of the added expense, documentation and inspection requirements.
- **Vehicles registered in Connecticut that are operated out-of-state – Connecticut -** DMV has recently changed its policies with respect to detecting vehicles that are registered in the State of Connecticut, but are being operated outside of the state, to avoid being emission tested. Specifically, under its

current procedures, DMV will not allow a vehicle owner to receive numerous time extensions. These efforts are definitely helping to make vehicles registered in Connecticut emissions compliant.

Percent of Failed Vehicles That Ultimately Pass

To determine whether vehicles that failed their emissions test ultimately pass, the fate of vehicles failing the I/M test in 2011 was evaluated. Failures for the first two months of 2011 were tracked through 12/31/2011. Results are shown in the table and figure below.

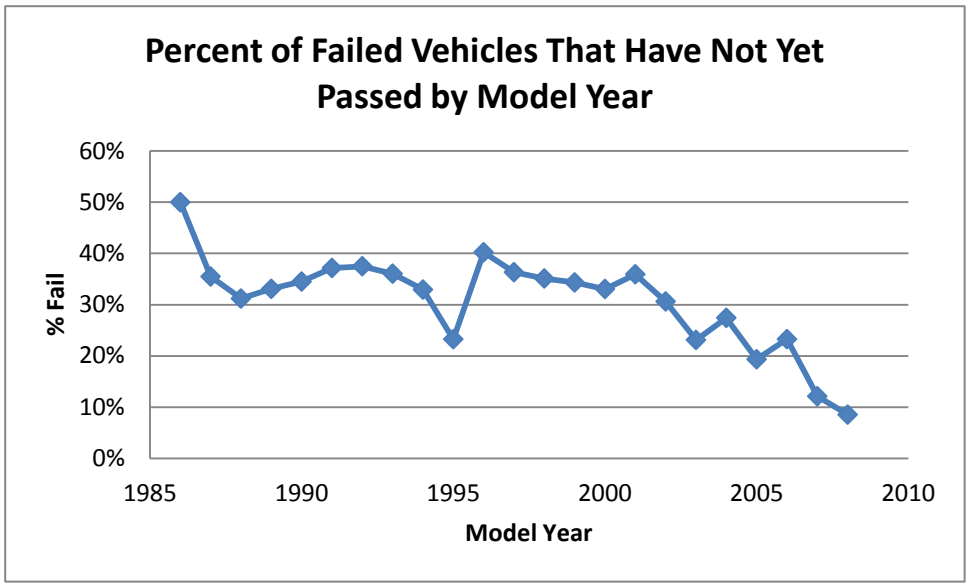
Overall, 30% of the failures during this two month period had not yet received a passing result or waiver. Results were similar in 2010, where again 30% of the failures during the first two month period had not yet received a passing result or waiver by the end of the year. Overall in both years, over 98% of the vehicles that were tested complied with I/M program requirements. Ultimately, all vehicles must comply, or they cannot be registered in Connecticut, since I/M compliance is a prerequisite for vehicle registration.

As Connecticut has done in previous reports per EPA recommendations, these results are calculated as the percentage of vehicles with no known final outcome as compared to vehicles that initially failed and do not receive a final pass. EPA's comments on the 2010 Evaluation requested that the state note that this methodology is EPA's preferred approach. EPA also states that until further notice, Connecticut may alternatively continue to report this information in Appendix B as the percentage of vehicles with no final pass, based on vehicles initially failed, as the state has done historically.

EPA's comments on the 2010 Evaluation also acknowledge the fact that a more effective I/M program may lead to the sale of vehicles that cannot pass the required I/M test and subsequent re-registration, perhaps in a different state/area with more relaxed testing requirements. To address this potential outcome, EPA recommends that state/areas with I/M programs develop Vehicle Identification Number (VIN)-based databases for vehicles that fail I/M tests and do not receive final passing results. Given that Connecticut, like many states, is operating under constrained resources, EPA must provide the necessary multistate database before a more comprehensive evaluation can be conducted.

Vehicles Tested from 1/1/11 to 3/1/11
with No Known Outcome

Model Year	Initial Fail	Final Retest Pass	No Final Pass	% No Final Pass
1986	4	2	2	50%
1987	93	60	33	35%
1988	109	75	34	31%
1989	136	91	45	33%
1990	142	93	49	35%
1991	148	93	55	37%
1992	216	135	81	38%
1993	258	165	93	36%
1994	340	228	112	33%
1995	430	330	100	23%
1996	900	538	362	40%
1997	1445	920	525	36%
1998	1350	876	474	35%
1999	1794	1178	616	34%
2000	1579	1057	522	33%
2001	1247	799	448	36%
2002	1316	913	403	31%
2003	1471	1131	340	23%
2004	813	590	223	27%
2005	1086	876	210	19%
2006	460	353	107	23%
2007	619	544	75	12%
TOTAL	**16,380**	**11,434**	**4,946**	**30%**



This chart shows the percentage of vehicles that failed the emission test in the first two months of 2011 and never ultimately passed in 2011. The increase from 1995 to 1996 indicates that compliance with the OBD test may be more difficult than the tailpipe test used for pre-1996 vehicles.

Waivers Issued

Another aspect related to enforcement is the number of waivers issued. Program effectiveness is inversely proportional to the waiver rate. As the following table shows, only 0.3% of the vehicles that failed received waivers, indicating that the program is effective. This is much lower than the waiver rates in many other states' I/M programs. Connecticut's I/M SIP committed to a waiver rate of 1%.

Conclusion: Connecticut exceeds SIP requirements for enforcement of motorist compliance. The overall compliance rate in Connecticut exceeds 96%, which is the compliance rate of Connecticut's SIP. Connecticut actively investigates non-compliance and assesses a large number of fines for vehicles that are not presented for emission inspection in a timely manner. Connecticut issues fewer waivers than committed to in Connecticut's SIP.

% of Failed Vehicles Receiving Waivers in 2011

Model Year	Passenger car (P)	Truck (T)	Total # of Waivers	# of Failed Vehicles	% of Failed Vehicles Receiving Waivers
1987	6	0	6	837	0.72%
1988	1	2	3	903	0.33%
1989	2	0	2	1,038	0.19%
1990	1	1	2	1,032	0.19%
1991	3	0	3	1,145	0.26%
1992	6	0	6	1,520	0.39%
1993	4	1	5	1,933	0.26%
1994	1	0	1	2,167	0.05%
1995	5	1	6	2,809	0.21%
1996	19	4	23	5,472	0.42%
1997	28	7	35	8,110	0.43%
1998	21	10	31	8,513	0.36%
1999	25	9	34	10,244	0.33%
2000	38	11	49	13,403	0.37%
2001	42	19	61	14,561	0.42%
2002	18	5	23	8,149	0.28%
2003	14	11	25	10,758	0.23%
2004	4	8	12	4,905	0.24%
2005	3	5	8	7,299	0.11%
2006	2	1	3	2,818	0.11%
2007	0	1	1	4,130	0.02%
Total	**243**	**96**	**339**	111,746	0.30%

Enforcement of Proper Test Procedures Through Trigger Reports and Video Audits

Connecticut is a model for other states in how to enforce proper I/M test procedures. Connecticut actively looks for cases where inspectors may be performing improper inspections, passing vehicles that otherwise should fail. The following is a summary of how Connecticut ensures that stations perform proper inspections:

- DMV runs extensive trigger reports to assure that inspection stations follow proper test procedures. The following demonstrates that DMV has developed a comprehensive set of triggers to verify and enforce compliance with proper test procedures:.
    - Trigger reports look for anomalies in data recorded during inspection. These reports help DMV identify stations performing fraudulent or inaccurate inspections.
    - Triggers focus on finding the following types of fraud:
        - Clean Scanning: Performing an OBDII test on a fault-free vehicle instead of the vehicle that should be tested.
        - Clean Piping: Performing a tailpipe test on a passing vehicle instead of the vehicle that should be tested.
    - These reports are generated frequently to identify stations performing improper inspections. Connecticut promptly investigates all significant cases of possible inspection fraud.
- In addition to the auditing conducted by DMV, DMV requires its Contractor to conduct additional audits.
- On a monthly basis, DMV rotates staff, so that there are two full time video auditors who continually monitor inspections during station operating hours via digital web cameras. Video audits have the following features:
    - Real time monitoring/control of vehicle inspections;
    - Video auditors can selectively view inspections; and
    - If anomalies are detected, DMV requires its contractors to take affirmative actions to halt the inspection.
- No other state does more thorough trigger or video audits and follow-up actions.

Triggers for Clean Scanning/Clean Piping

DMV runs several trigger reports to identify clean scanning and clean piping:

- **Mismatch between entered Vehicle Identification Number (VIN) and OBDII VIN** – Certified Testing Inspectors (CTI) may attempt to pass vehicles with OBDII faults by scanning a problem-free vehicle instead of the one that should be inspected.
    - If the vehicle has an electronic VIN available through the vehicle's OBDII system, clean scanning cases can be identified by comparing entered VIN with VIN provided by vehicle's OBDII system.
    - DMV investigates all VIN mismatches. Most mismatches correspond to vehicles owned by the same person or vehicles that had Program Control Modules replaced without proper programming of the vehicles' computer with the correct VIN, also termed reflashing.
- **Questionable Retests** – Mismatches between initial tests and retests could indicate that the inspector clean-scanned vehicles on retests. DMV checks the following parameters:
    - Supported readiness monitors – different vehicles have different monitors;
    - OBD computer identifiers;
- **Short Time Between Initial OBD Test Fail And Retest Pass** – Stations that often show short time periods, in particular one half hour, between the initial test failure and retest pass could be performing fraudulent inspections. (Short Time Period = ½ hour)
    - It is difficult to repair OBD failures and get failing vehicles to pass within a short time period:
        - MIL-On Fails – It takes time for the MIL to go off, or readiness monitors to reset if codes are cleared.
        - Readiness Fails – It takes time for readiness monitors to set to ready, especially the evaporative monitor.
- **Large Emission Reductions in a Short Time Period (1981-1995 Vehicles)** – Stations reporting large emission reductions in a short time period are more likely to be clean piping the retests. (Short Time Period= ½ hour)
- Overall, 338 trigger incidences were logged by DMV in 2011, which is about 0.3% of the inspections performed. This indicates that inspection fraud is not a serious problem in Connecticut.

Conclusion: Evaluation of the data demonstrates that Connecticut vigorously enforces proper inspection procedures. Inspection fraud is not a problem in Connecticut's I/M program. Connecticut actively investigates possible cases of inspection fraud and initiates corrective action. Less than 0.3% of the tests in Connecticut are suspect.

5.0 Quality Assurance Audits

The DMV and their contractor, Applus, perform the quality assurance (QA) audits required by EPA. Following is an overview of Connecticut's audits, and other QA activities conducted by DMV.

Overt Audits

EPA requires that Overt Audits be performed twice per year per station. DMV meets these requirements through use of the Emission Test Monitoring Report (ETMR). Connecticut prepares ETMRs more frequently than required by EPA. Each month, at least one ETMR is performed on each station. Due to Connecticut's recession-related resource constraints during this past cycle, fewer agents were available for audits, however, the number of stations audited and violations identified remained consistent. In addition, Applus also performs overt audits. Connecticut also checks more items than required by EPA. Connecticut is continuing to evaluate the auditing process to build upon the program's success.

Stations	**2010**	**2011**
Total Overt Audits Performed	3,187	2,998
No. of Stations Audited	254	257
No. of Times Each Station Was Audited (range)	1 - 31	0* - 23
No. of Stations That Had No Violations for the Entire Year	135	108
Total Number of Audits for which One or More Violations Were Reported	287	287
No. of Stations That Had Violations	119	151
No. of Stations That Had 1-3 Violations	98	132
No. of Stations That Had 4-6 Violations	17	19**
No. of Stations That Had 7-12 Violations	4	0
Agents		
No. of Agents That Performed Audits During the Course of the Year	15	10
No. of Agents That Are No Longer Performing Overt Audits	5	1
No. of Agents That Are Currently Assigned to Perform Audits	10	9
No. of Audits per Agent (range)	40 - 374	152 - 533
No. of Station Violations Reported per Agent (range)	0 - 98	3 - 110

*ST0005000 came on line November 12, 2011.
ST0001363 came on line December 21, 2011.
**In 2011, the max number of violations incurred by any station was 5.

Equipment Audits

EPA requires that equipment audits be performed twice per year per station. DMV meets these requirements through the QA Audits. Connecticut conducts equipment audits more frequently than required by EPA. High volume stations are checked monthly, while low volume stations are checked twice per year. In addition, Applus also performs equipment audits. Connecticut checks more equipment items than required by EPA. While an audit may require a station to discontinue tailpipe testing, it can continue OBD testing. Therefore, no stations were totally shut down due to a failed gas equipment audit. Results are presented below. The high number of failed equipment (gas) audits was due to the aging analytical benches and the lack of readily available replacement parts from the manufacturer. This issue will be resolved with the roll out of new, more reliable benches in the new program.

Results of Equipment Audits

Parameter	2010	2011
Total Equipment Audits	834	932
Total Stations that Failed Equipment Audit	160	171
Percentage of stations that failed an equipment (gas) audit	55.94%	67.32%
Number of stations totally shut down as a result of a failed equipment (gas) audit[12]	0	0
Percentage of stations shut down as a result of failed equipment (gas) audit	0.0%	0.0%

12 Stations that fail equipment audit are prohibited from performing tailpipe emission testing until the equipment problem was resolved. Stations were allowed to continue to perform OBD testing.

Covert Audits

EPA requires that covert audits be performed at least once per year per station. DMV meets these requirements by performing covert audits and video surveillance audits.

During 2011 covert audit vehicles were only available for the first two months, due to resource constraints related to the recession. Although the new program requires the contractor to provide vehicles for auditing, contract delays pushed the implementation of this aspect of the new program to the end of 2011, making additional audit vehicles unavailable. As a result, DMV only performed 49 covert audits in 2011. However, DMV performed 2,051 video surveillance audits, which repeatedly have been proven to be more effective than covert audits in detecting fraud.

Warnings are routinely issued for false passes if DMV does not find that the CTI intentionally or negligently falsely passed a vehicle, thus there can be a difference between the number of false passes and suspensions. Suspensions are usually associated with violations found from trigger reports and data audits. Most false passes are for minor procedural errors, such as failing to perform the visual MIL check correctly. Unless the station repeats these errors, they are issued warnings rather than being suspended.

As stated in the Applus contract, and in the Applus 'station agreement', a CTI is suspended (pending an investigation) when it is determined that the false pass was the result of "Intentionally improperly passing a failing vehicle." Most errors identified by covert and video surveillance audits were determined to be unintentional and due to poor attention to detail. However, a second occurrence of making a careless error, such as missing or incorrectly answering the MIL question, results in an automatic suspension.

Connecticut is a model for running trigger reports and following-up on the issues identified as a result of those audits. Suspensions for violations other than covert audit findings or triggers were for various reasons as outlined in the contract under "Inspector Violations," including, but not limited to data entry errors or incorrect test procedures. The statutory and regulatory basis of the program does not allow Connecticut to issue fines or hold hearings concerning inspectors that falsely pass vehicles in covert audits. Instead, these inspectors are suspended from testing. Whether or not to suspend a station depends on the assessment of the severity of the infraction by Applus.

Contractor QA Activities

Fraud Prevention Systems

In addition to Connecticut's efforts to eliminate fraudulent and inaccurate tests, the State's contractor, Applus, has implemented systems to prevent fraud, including the Connecticut Decentralized Analyzer System (CDAS), provided by Applus, which has features to assure that accurate emissions tests are performed. These systems and features are described below:

- Secure iris recognition system – use of biometrics
- Trend analysis monitoring –
    - Test time duration
    - Initial and retest pass/fail rate
    - Repair costs
    - Waivers
    - Speed variability check
    - Gas cap failure analysis
    - After hours inspection analysis
    - Aborted inspection analysis

Analyzer QA Functions

- Sample system leak check
- Analyzer gas calibrations – Every 72 hours or system will lock out testing
- CDAS units require a two point calibration with BAR 97 high gas followed by BAR 97 low gas blend
- CDAS units have passed BAR 97 certification tests
- Dynamometer undergo a coast down every 72 hours
- Raw transport time verification
- Various other hardware checks are done every 72 hours
- Low sample flow, sample dilution checks etc.

Contractor QA Activities (cont.)

Inspection Results Analysis Audits – monitoring of performance indicators

- # of offline inspections
- Gas cap failures
- OBD failures
- After hours testing

Digital Audits – monitoring of equipment service and repair

- Leak check failures
- NO cell age
- Gas cap calibration failure
- NO response time
- CO response time
- O2 response time
- NO low calibration gas drift
- Bench low calibration failure rate
- Parasitic loss changes

Conclusion: While Connecticut did not meet the required number of covert audits in this inspection cycle due to extenuating circumstances, Connecticut's actions nonetheless demonstrate substantial compliance with EPA's recommended levels of quality assurance.

6.0 Assessment of OBD Testing Issues

Vehicles with Readiness Issues that are Not Currently Exempted from Readiness Requirements

EPA allows states to exempt vehicles from readiness requirements, if they have design flaws that cause them to frequently fail for readiness. In 2007, Connecticut updated its readiness exemption list to include vehicles that had extremely high not ready rates. Based on data from tests performed in 2010 and 2011, no additional vehicle models need to be added to the readiness exemption list. ***Connecticut does not need to update its readiness exemption list at this time.***

Vehicles That Fail to Communicate with Connecticut's Test System

A small percentage (0.7% to 0.8%) of the vehicles with OBDII systems fail to communicate with Connecticut's inspection system. In 2010, four models were identified that had high no communication rates. Connecticut's I/M contractor improved the interface for three of the models, and one model (1997 Acura TL) was exempted from the electronic portion of the OBD test. In 2011, only one model had high no communication rates. During 2010, most of vehicles that failed to communicate with test equipment received a visual MIL check to determine if they passed or failed inspection. In 2011, vehicles that failed to communicate with test equipment failed inspection.

Vehicles With High No Communication Rates: 2010

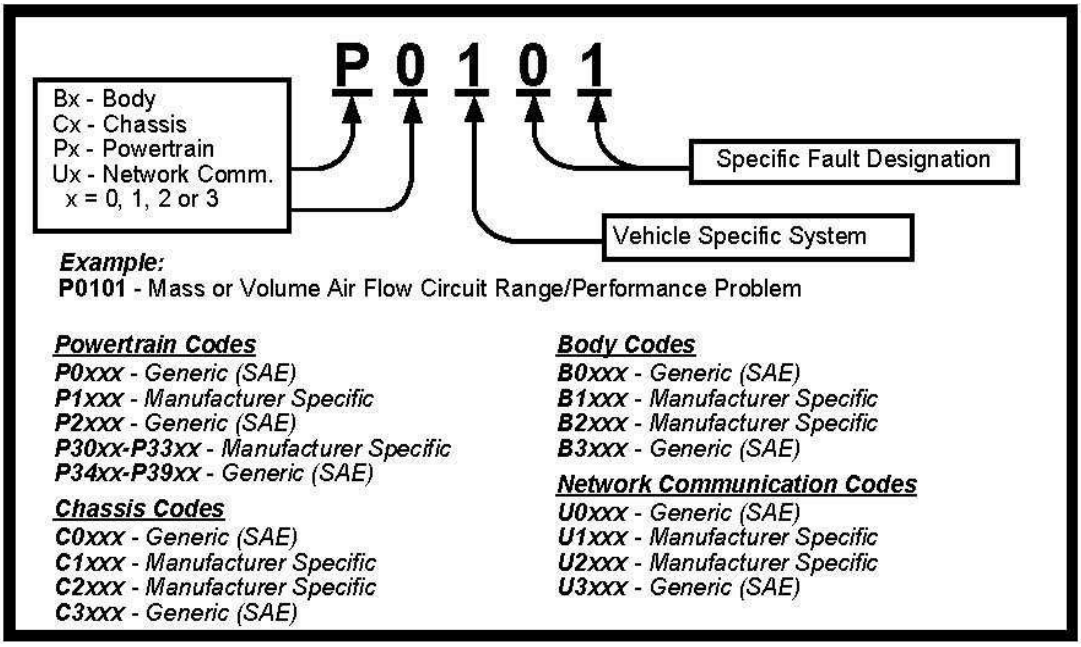
Model Year	Make	Model	OBD Tested	# No COM	No COM Rate
1997	ACURA	2.5TL	67	67	100%
2006	Volkswagen	Multiple	788	726	92%
2006	Mercedes Benz	Multiple	890	680	76%
2006	Audi	Multiple	438	826	53%

Vehicles With High No Communication Rates: 2011

Model Year	Make	Model	OBD Tested	# No COM	No COM Rate
2004	Cadillac	Escalade	12	6	50%

Diagnostic Trouble Codes (DTCs) Recorded in OBDII Failures

The Malfunction Indicator Light (MIL) is part of the OBD system and is used to alert the driver of a potential issue with the vehicle's computerized engine management system. Whenever the MIL is illuminated a Diagnostic Trouble Code (DTC) should be stored in the vehicle's computer. DTCs describe the problem that caused the MIL to go on. Before OBDII, each manufacturer had their own specific trouble code list and code definitions. Under the OBDII requirements, all manufacturers must comply with a standardized convention for DTCs. The universal DTC format consists of a 5-character alphanumeric code, consisting of a single letter character followed by four numbers. The following is an example of the standardized coding for DTCs.



Top 10 DTCs in Connecticut

Following is a list of the most prevalent DTCs in Connecticut in 2010 and 2011. This table lists the ranking of the most prevalent DTCs along with the frequency of its occurrence, expressed as a percentage. Note that the top 10 DTCs are present in about 62% of the MIL-on cases, even though there are over 1000 possible DTCs. The ranking is nearly identical in both years.

Connecticut's Top 10 DTCs				
	2010		2011	
DTC	Rank	%	Rank	%
P0420 – Low Catalyst Efficiency	1	11.78%	1	12.55%
P0171 -- System Too Lean: Bank 1	2	8.27%	2	8.06%
P0442 -- Evaporative Emission Control System Leak Detected (small leak)	3	7.43%	3	7.38%
P0455 -- Evaporative Emission Control System Leak Detected (gross leak)	4	7.25%	4	7.14%
P0401 – Exhaust Gas Recirculation (EGR) Flow Insufficient	5	5.20%	5	4.92%
P0300 -- Random Misfire	6	4.86%	6	4.79%
P0440 -- Evaporative Emission Control System Malfunction	8	4.49%	7	4.55%
P0174 -- System Too Lean: Bank 2	7	4.66%	8	4.46%
P0141 -- 02 Sensor Heater Circuit Malfunction	9	4.44%	9	4.23%
P0135 -- 02 Sensor Heater Circuit Malfunction	10	4.15%	10	3.83%
Total		62.52%		61.92%

7.0 2009 to 2011 Inspection Cycle Analysis

A dataset of vehicles that were tested in both 2009 and 2011 was created with the goal of determining the durability of repairs performed on vehicles failing in 2009.

Failure Rates

Failure rates (overall, by test type and by model year) in 2011 were determined for the following groups of vehicles that were tested in 2009:

- Passed initial test in 2009; or
- Failed initial test/passed retest in 2009.

The failure rate for 2011 was 8% for the sample of vehicles that passed their initial test in 2009. The failure rate in 2011 was much higher, 22%, for the sample of vehicles that failed in 2009, and were subsequently repaired in order to pass.

Emission Rates

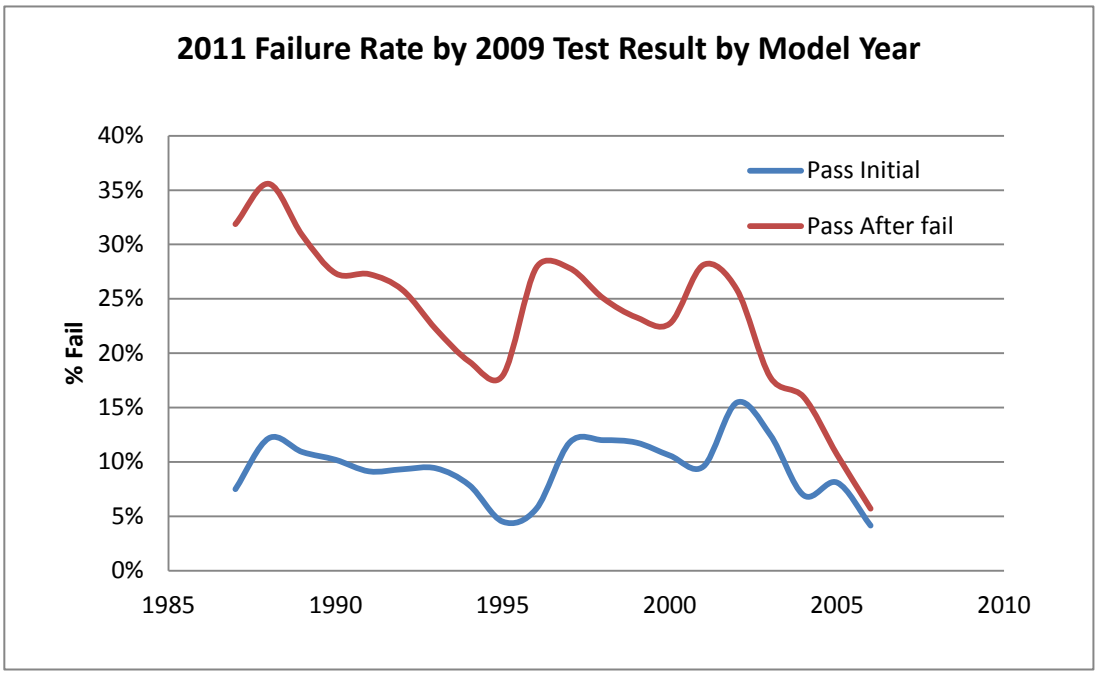
Since the ASM2525 test allows a quantification of emissions levels that the other test procedures do not provide, emissions data from vehicles that had received these tests were evaluated to project how much emissions increased over the two year cycle.

Average ASM2525 emission rates (overall and by model year) for 1995 and older models in 2009 and 2011 were calculated for vehicles for the following groups:

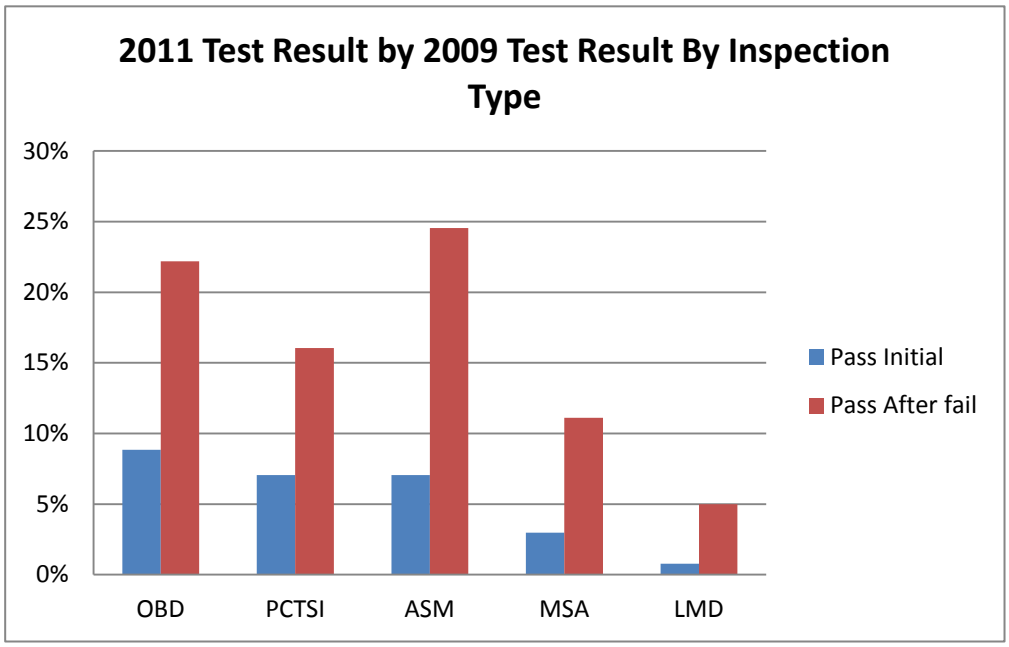
- Passed initial test in 2009; or
- Failed initial test but passed retest in 2009.

Emissions were significantly higher two years later for vehicles that failed and were repaired to pass in 2009. On the other hand, vehicles that passed their initial test in 2009 saw minimal increases in emissions in 2011, which indicates that they were capable of maintaining good control over emissions despite their age.

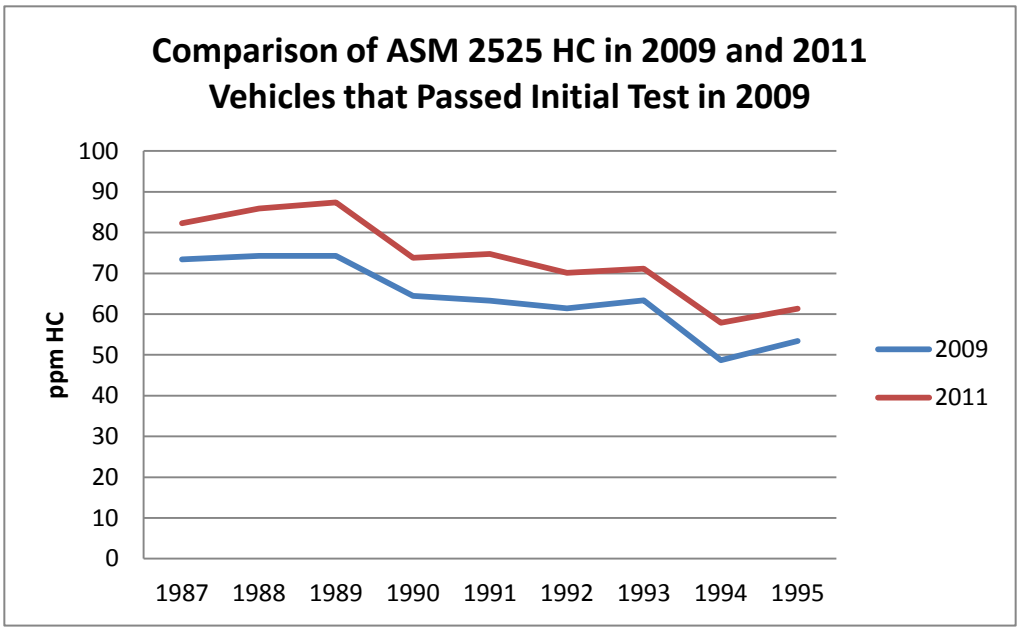
The high failure rates and emissions levels in 2011 for vehicles that failed and were repaired to pass in 2009 may be due to several factors, including that some vehicles are more prone to be high emitters, even after they are repaired. The higher emissions and failure rates for previous failures may also indicate that repair quality can be significantly improved, but an evaluation of this possibility was not possible since the data on who conducted the repairs in 2009, i.e., Certified Repairers, non certified repairers, or self repairs by the motorist were not available. The charts that follow have details on this analysis.



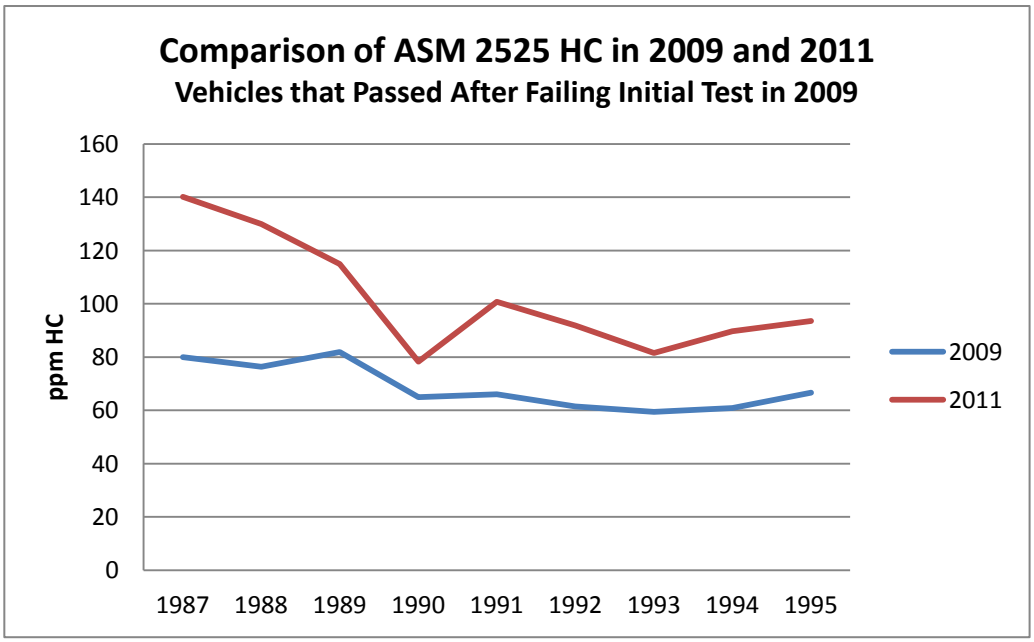
This chart shows failure rates by model year in 2011 for vehicles that passed in 2009. Failure rates in 2011 are compared for two groups of vehicles: 1) vehicles that passed their initial test in 2009 and 2) vehicles that failed and were repaired to pass in 2009. The second group had much higher failure rates in 2011, indicating that these vehicles may be more prone to failing I/M inspections.



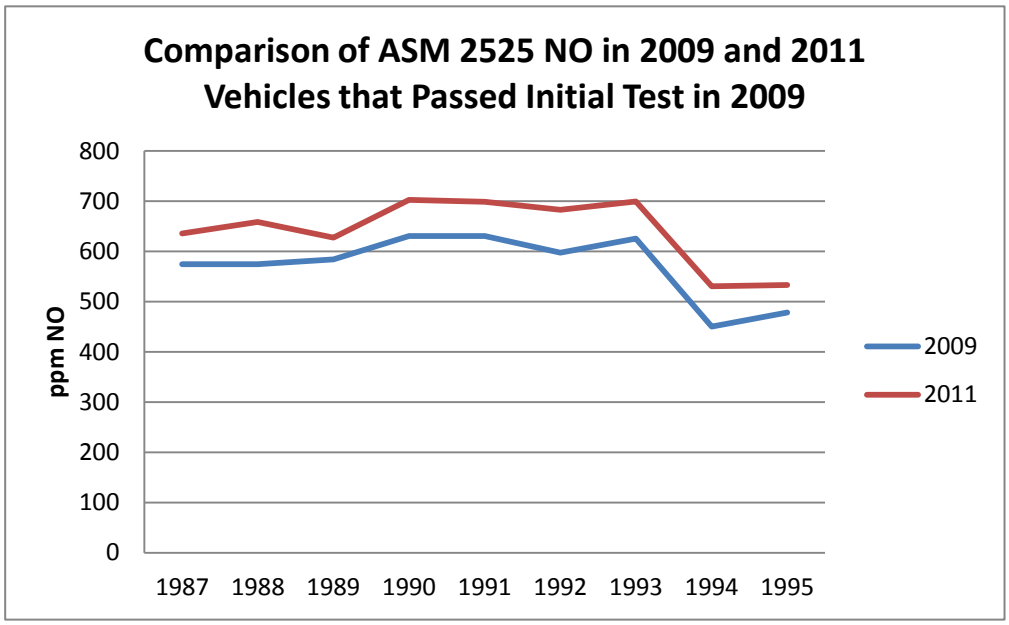
This chart shows failure rates by inspection type in 2011 for vehicles that passed in 2009. Failure rates in 2011 are compared for two groups of vehicles: 1) vehicles that passed their initial test in 2009 and 2) vehicles that failed and were repaired to pass in 2009. The second group had much higher failure rates in 2011 for all inspection types indicating that these vehicles may be more prone to failing I/M inspections.



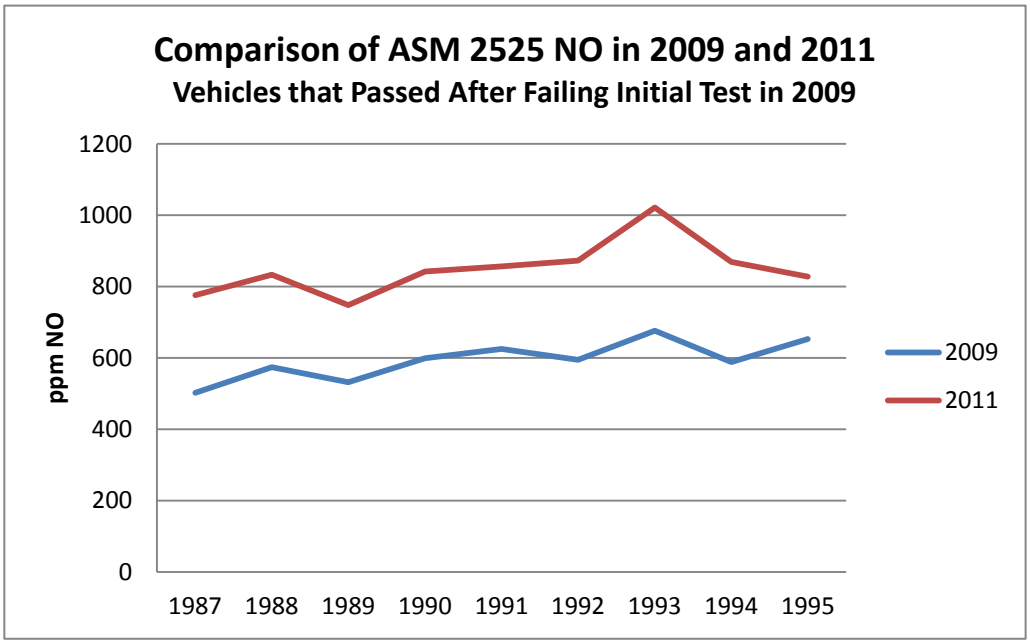
This chart shows average HC emissions by model year in 2009 and 2011 for vehicles that passed their initial test in 2009. Emissions increase slightly from 2009 to 2011. This indicates that many older vehicles can maintain low emissions levels.



This chart shows average HC emissions by model year in 2009 and 2011 for vehicles that passed their retest in 2009. Emissions increase significantly from 2009 to 2011. This may indicate that many repairs may not have fully addressed the emissions problem in any given vehicle.



This chart shows average NO emissions by model year in 2009 and 2011 for vehicles that passed their initial test in 2009 Emissions increase slightly from 2009 to 2011. This indicates that many older vehicles can maintain low emissions levels.



This chart shows average NO emissions by model year in 2009 and 2011 for vehicles that passed their retest in 2009. Emissions increase significantly from 2009 to 2011. This may indicate that many repairs may not have fully addressed the emissions problem in any given vehicle.

7.0 Program Enhancements in 2012 and in the Future

DEEP and DMV evaluate Connecticut's I/M program to ensure that it continues to operate accurately and effectively while assuring air quality benefits are achieved. In 2011, DMV executed a new contract to upgrade the I/M program. The new program will continue to perform tailpipe tests on pre-1996 vehicles, which do not have OBD systems. This will maintain the air quality benefits necessary to meet Clean Air Act requirements and statutory restrictions.

Due to time constraints, rolling implementation of the new program will occur. A new type of bench, which is known to be more reliable, will be utilized, resolving the high rate of equipment (gas) auditing failures. The vendor will supply the vehicles for covert auditing, with DMV staff continuing to conduct the auditing procedures.

Connecticut will continue with stringent quality assurance and fraud detection activities. In addition to conducting ongoing assessments of the I/M program, Connecticut will seek out additional opportunities to increase the effectiveness of the program. For example, the next generation Connecticut Vehicle Inspection Program will place additional emphasis on the training and evaluation of the effectiveness of the role of the repair industry in overall program compliance.

The following enhancements to the Emissions Program are being implemented:

1. The time extensions policy was changed to disallow a vehicle owner from receiving numerous time extensions.
2. Iris Enrollments are now done by Applus.
3. Iris enrollment prompts are now included in CDAS. An Iris scan cannot be replaced by badge use without previously calling in a work order and the CTI will be locked out without such a work order.
4. VIN enforcement now includes more safeguards to ensure the correct VIN is entered.
5. An evaluation of safeguards is being conducted to improve the accuracy of the GVWR that is entered through the registration process.
6. A video of the test is now stored with test record.
7. More cameras are being used per lane. Now there are a total of four (3 plus iris), previously there were a total of 3 (2 plus iris).
8. New monitoring with an engine temperature sensor ensures the vehicle is warmed up prior to receiving a tailpipe test.
9. The Testing Reciprocity document with other states was updated. Reciprocity testing is limited to one inspection cycle.
10. The Dashboard is now equipped with automated audit and includes:
    a. Reports
        - Official Test Report
        - Notification Letters Report
        - Offline By Test Center Report
        - Video Streaming

- Consecutive No Communications Report
- Weather Station Report
- Calibration Reports
- VIR Reprint
- Aborted / Incomplete Test Report
- TSI Cutpoint Report
- Inventory Adjustment Report

b. Test Center Documents
- CDAS Materials
- Fast Fact Messages
- Certified Emissions Repair Technicians (CERT)
- Test Center Materials
- Certified Testing Inspector (CTI) Form
- Training Materials

c. Non-Compliance
- Software Version Compliance
- Vehicles with GVWR>8,500 Pounds
- Monitor Mismatches
- Inspector ID Entry
- Software Version Non-Compliance
- All OBD Monitors Display Unsupported
- OBD Short Time Tests <= ½ Hour
- VIN Entry Type
- Offline Test Rates
- OBD VIN Mismatch
- A/C Monitor Ready or Not Ready
- ASM Short Time Test <= ½ Hour
- PID and PCM Mismatches
- Aborted Inspection

11. Stations and CTIs are locked out of the system if penalties assessed by Applus according to the contract/station participation agreement schedule of infractions, as established in the Compliance Action Plan, are not received.
12. Challenge test process has been streamlined to ensure the equipment is functioning properly. The procedure now entails first contacting Applus to verify the proper operation of equipment.
13. More diesel test station locations have been brought into the program.
14. CO detectors are now required at all test facilities.
15. System lockouts now occur for weather station anomalies.
16. Equipment tamper/malfunctions generate automatic email notifications.
17. DSL or faster internet connection is now required for test equipment.
18. Every CTI was retrained prior to the start of the new program.

19. Emissions staff are now all centrally stationed in Wethersfield to improve logistics.
20. The fleet testing program is being reviewed especially with respect to training and maintenance.
21. Cameras with higher megapixel resolution are now being used.
22. DMV now has access directly to the enhanced comprehensive Work Order database, which enhances review.
23. The Work Order database now indicates all work orders.
24. Work Order database now indicates test type affected.
25. There is new guidance for issuing waivers, including how the nature of the repair has to equate to the reason for failure.
26. Presently revising the CTI training manual to allow for DMV review of training evaluations as a tool to modify and amend the training to increase efficiency. The new manual also is intended to be used for oversight of equipment malfunction.

8.0 Conclusions

Key conclusions from this analysis:

- Connecticut is failing the expected number of vehicles. Overall, 12% of the vehicles tested failed inspection in 2010 and 2011. 30% of the vehicles that failed in the first two months of 2011 did not receive a passing result or waiver by the end of 2011. Ultimately these vehicles must comply with I/M requirements, since compliance with I/M standards is a prerequisite to vehicle registration. The enforcement of Connecticut's I/M program exceeds the enforcement levels assumed in emissions modeling for the Connecticut SIP.
- Over 98% of the vehicles subject to I/M requirements comply with standards. Connecticut actively investigates non-compliance and assesses fines for late inspections. In 2010 and 2011, respectively, 159,163 and 162,936 fines were assessed for late inspections. Linking registration to compliance in addition to late inspection fines contribute to Connecticut's very high compliance rate.
- While Connecticut did not meet the required number of covert audits in this inspection cycle due to extenuating circumstances. Connecticut's actions nonetheless demonstrate substantial compliance with EPA's recommended levels of quality assurance.
- Connecticut conducts extensive compliance assurance activities on the I/M program. Evaluation of these quality assurance data demonstrates that the program performs accurate inspections. Connecticut is a national model for other states' enforcement activities.
- Connecticut's new I/M contract is designed to ensure the I/M program continues to effectively achieve the expected air quality benefits. Challenges associated with some of the existing protocols will be resolved with the full implementation of the new program.

Appendix A
EPA Checklist

Appendix A:
40 CFR Part 51 - Subpart S Inspection/Maintenance Program Requirements
51.366 - Data Analysis and Reporting Requirements

Reporting Requirement	**Reviewer Comments / Location in State Report**	**Has the State Met the Requirement?**
(a) Test Data Report The program shall submit to EPA by July of each year a report providing basic statistics on the testing program for January through December of the previous year, including:		
(1) The number of vehicles tested by model year and vehicle type;		
(2) By model year and vehicle type, the number and percentage of vehicles:		
(i) Failing initially, per test type;		
(ii) Failing the first retest per test type;		
(iii) Passing the first retest per test type;		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(iv) Initially failed vehicles passing the second or subsequent retest per test type;		
(v) Initially failed vehicles receiving a waiver; and		
(vi) Vehicles with no known final outcome (regardless of reason). *(vii)-(x) [Reserved]*		
(xi) Passing the on-board diagnostic check;		
(xii) Failing the on-board diagnostic check;		
(xiii) Failing the on-board diagnostic check and passing the tailpipe test (if applicable);		
(xiv) Failing the on-board diagnostic check and failing the tailpipe test (if applicable);		
(xv) Passing the on-board diagnostic check and failing the I/M gas cap evaporative system test (if applicable);		
(xvi) Failing the on-board diagnostic check and passing the I/M gas cap evaporative system test (if applicable);		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(xvii) Passing both the on-board diagnostic check and I/M gas cap evaporative system test (if applicable);		
(xviii) Failing both the on-board diagnostic check and I/M gas cap evaporative system test (if applicable);		
(xix) MIL is commanded on and no codes are stored;		
(xx) MIL is not commanded on and codes are stored;		
(xxi) MIL is commanded on and codes are stored;		
(xxii) MIL is not commanded on and codes are not stored;		
(xxiii) Readiness status indicates that the evaluation is not complete for any module supported by on-board diagnostic systems;		
(3) The initial test volume by model year and test station;		
(4) The initial test failure rate by model year and test station; and		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(5) The average increase or decrease in tailpipe emission levels for HC, CO, and NOX (if applicable) after repairs by model year and vehicle type for vehicles receiving a mass emissions test.		
(b) Quality assurance report. The program shall submit to EPA by July of each year a report providing basic statistics on the quality assurance program for January through December of the previous year, including:		
(1) The number of inspection stations and lanes:		
(i) Operating throughout the year; and		
(2) The number of inspection stations and lanes operating throughout the year:		
(i) Receiving overt performance audits in the year;		
(ii) Not receiving overt performance audits in the year;		
(iii) Receiving covert performance audits in the year;		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(iv) Not receiving covert performance audits in the year; and		
(v) That have been shut down as a result of overt performance audits;		
(3) The number of covert audits:		
(i) Conducted with the vehicle set to fail per test type;		
(ii) Conducted with the vehicle set to fail any combination of two or more test types;		
(iii) Resulting in a false pass per test type;		
(iv) Resulting in a false pass for any combination of two or more test types;		
(4) The number of inspectors and stations:		
(i) That were suspended, fired, or otherwise prohibited from testing as a result of covert audits;		
(ii) That were suspended, fired, or otherwise prohibited from testing for other causes; and		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(iii) That received fines;		
(5) The number of inspectors licensed or certified to conduct testing;		
(6) The number of hearings:		
(i) Held to consider adverse actions against inspectors and stations; and		
(ii) Resulting in adverse actions against inspectors and stations;		
(7) The total amount collected in fines from inspectors and stations by type of violation;		
(8) The total number of covert vehicles available for undercover audits over the year; and		
(9) The number of covert auditors available for undercover audits.		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(c) Quality control report The program shall submit to EPA by July of each year a report providing basic statistics on the quality control program for January through December of the previous year, including:		
(1) The number of emission testing sites and lanes in use in the program;		
(2) The number of equipment audits by station and lane;		
(3) The number and percentage of stations that have failed equipment audits; and		
(4) Number and percentage of stations and lanes shut down as a result of equipment audits.		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(d) Enforcement report. (1) All varieties of enforcement programs shall, at a minimum, submit to EPA by July of each year a report providing basic statistics on the enforcement program for January through December of the previous year, including:		
(i) An estimate of the number of vehicles subject to the inspection program, including the results of an analysis of the registration data base;		
(ii) The percentage of motorist compliance based upon a comparison of the number of valid final tests with the number of subject vehicles;		
(iii) The total number of compliance documents issued to inspection stations;		
(iv) The number of missing compliance documents;		
(v) The number of time extensions and other exemptions granted to motorists; and		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(vi) The number of compliance surveys conducted, number of vehicles surveyed in each, and the compliance rates found.		
(2) Registration denial based enforcement programs shall provide the following additional information:		
(i) A report of the program's efforts and actions to prevent motorists from falsely registering vehicles out of the program area or falsely changing fuel type or weight class on the vehicle registration, and the results of special studies to investigate the frequency of such activity; and		
(ii) The number of registration file audits, number of registrations reviewed, and compliance rates found in such audits.		
(3) Computer-matching based enforcement programs shall provide the following additional information:		
(i) The number and percentage of subject vehicles that were tested by the initial deadline, and by other milestones in the cycle;		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(ii) A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity; and		
(iii) The number of enforcement system audits, and the error rate found during those audits.		
(4) Sticker-based enforcement systems shall provide the following additional information:		
(i) A report on the program's efforts to prevent, detect, and enforce against sticker theft and counterfeiting, and the frequency of this type of activity;		
(ii) A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity; and		
(iii) The number of parking lot sticker audits conducted, the number of vehicles surveyed in each, and the noncompliance rate found during those audits.		

Reporting Requirement	Reviewer Comments / Location in State Report	Has the State Met the Requirement?
(e) Additional reporting requirements. In addition to the annual reports in paragraphs (a) through (d) of this section, programs shall submit to EPA by July of every other year, biennial reports addressing:		
(1) Any changes made in program design, funding, personnel levels, procedures, regulations, and legal authority, with detailed discussion and evaluation of the impact on the program of all such changes; and		
(2) Any weaknesses or problems identified in the program within the two-year reporting period, what steps have already been taken to correct those problems, the results of those steps, and any future efforts planned.		

Appendix B
2011 CT I/M Program Data

Appendix B
2011 CT I/M Program Data

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